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# The Far Eastern Review

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THE PIONEER IN ITS FIELD

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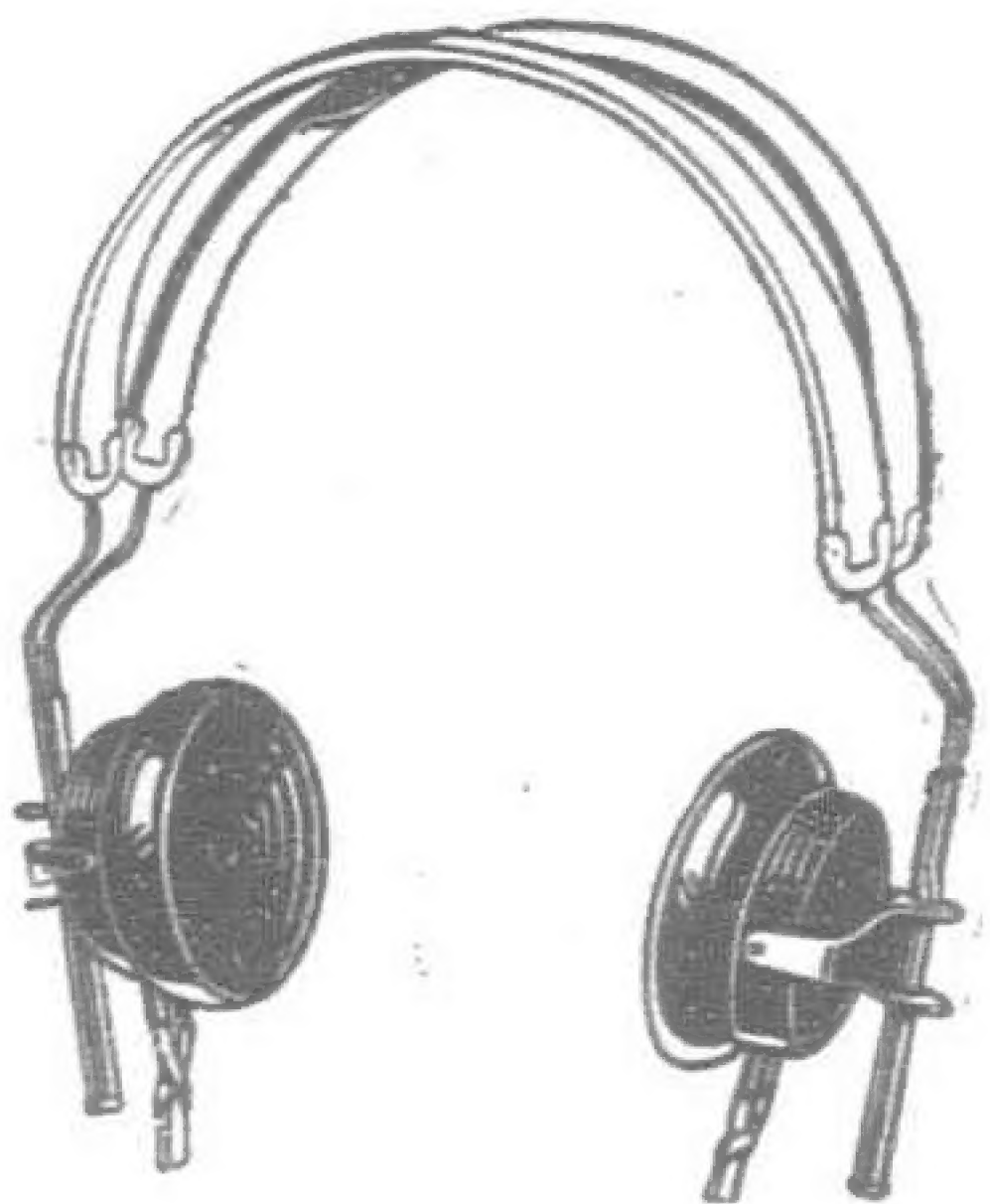
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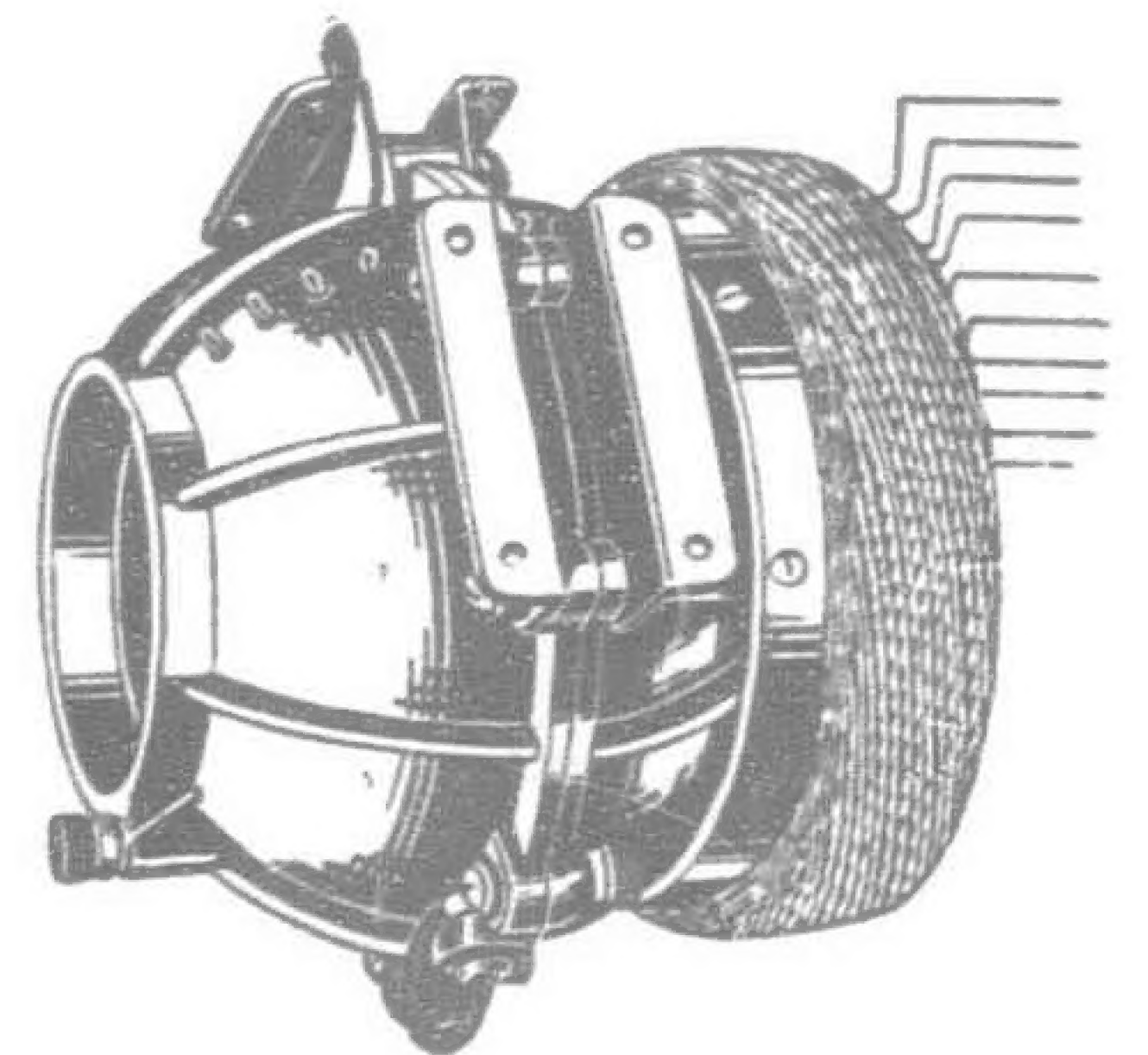


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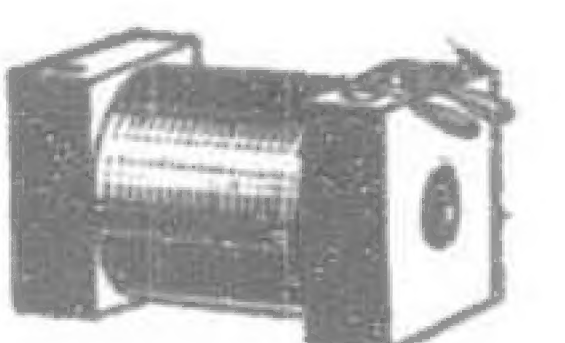
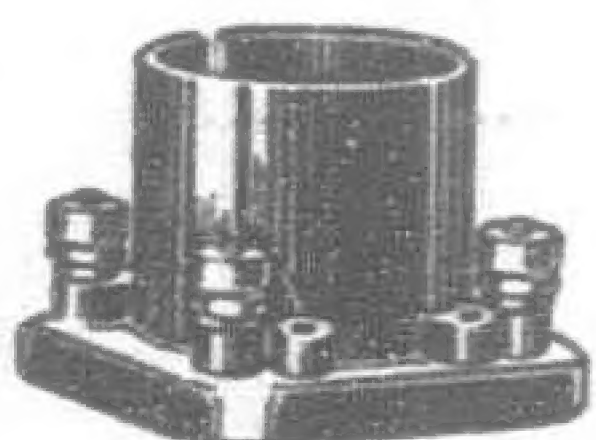
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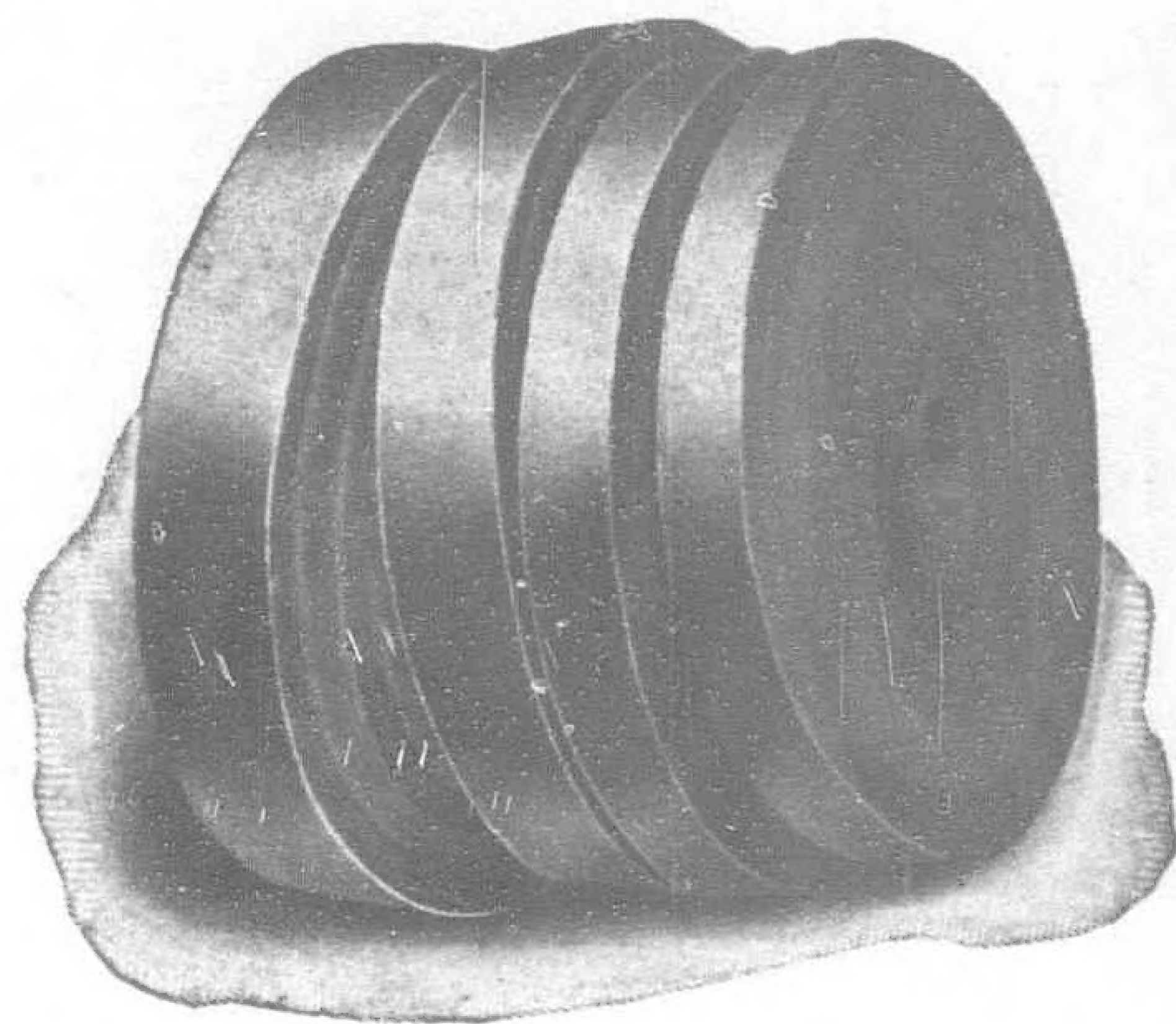
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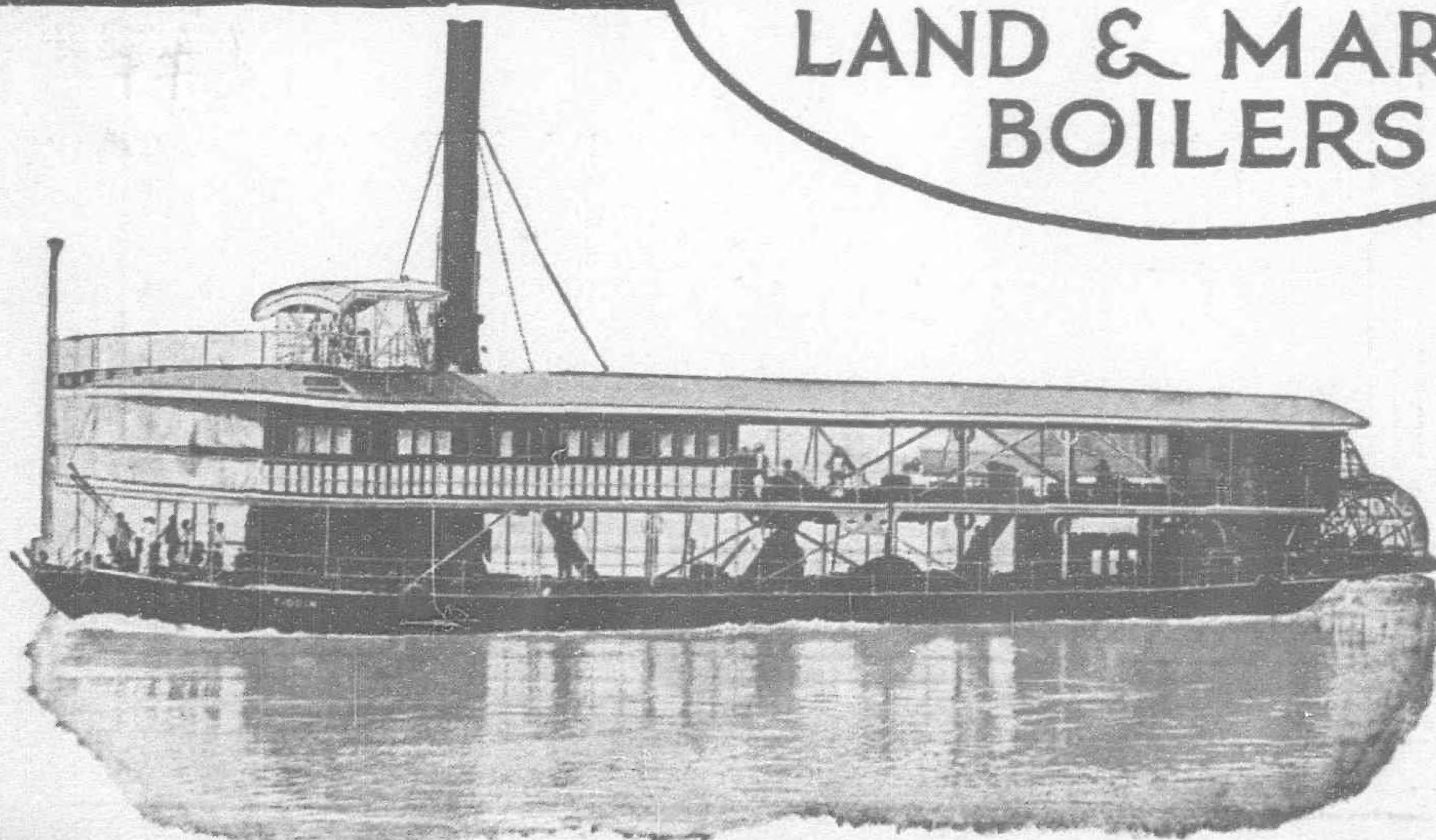
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ENGINEERING

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VOL. XIX

SHANGHAI, NOVEMBER, 1923

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## American Relief Work in Japan

THE great disaster which overtook Japan out of a clear sky, provided a new and wider field for the exuberant imagination of professional rumor mongers to find fault with that country. The versatility and ingenuity displayed in inventing slanders and villifying the Japanese, fabricating what passed as news out of the wildest and most improbable stories together with a refusal to see anything but the shortcomings of a people laboring under a terrible emotional strain are characteristic of the traditional "bunder" and trouble-maker whose natural habitat is China. We could understand why this embittered group rejoiced at this fresh chance to poison the atmosphere with attacks upon the Japanese government and people—it is their only stock in trade—but it taxes our imagination to explain why they should assail their own government and Red Cross Society for an alleged failure to succor destitute Americans and set them up in business. The only reasonable explanation which comes to our mind arises from the fact that these dyed-in-the-wool anti-Japanese Americans failed to direct the relief work and prevent that close understanding between Japan and America which permanently undermines their efforts to foster international ill-will.

The first concern of Ambassador Woods and his efficient staff headed by Lt.-Col. Burnett, was the relief of Americans in the devastated area and their immediate transportation to zones of safety or to their homes in the United States. The little American relief organization composed of volunteer workers having its headquarters at the Imperial Hotel in Tokyo labored day and night for the first two weeks until every American was accounted for, the living succored and the dead identified and decently buried. On receipt of the first news of the catastrophe, the state department at Washington cabled urgent orders to Consul-General-at-Large Nelson A. Johnson to proceed to Yokohama at once with Consul-General Cunningham and Vice-Consul Wright, report to the ambassador, re-establish the consulate and extend every aid to American merchants and travelers. The first naval vessels to arrive in Yokohama rushed food, clothing and other essential supplies to the temporary embassy at Tokyo for the express relief of Americans and at the same time furnished the Imperial Hotel with food which enabled it to feed all its guests and refugees which flocked there for shelter. At all times there was a store-room and dispensary at the hotel filled with every possible requirement for the prompt relief of Americans residing in the devastated areas who came every day or so for fresh supplies of food.

When General McCoy arrived in Tokyo to assume charge of the American army and Red Cross relief measures under the ambassador, his very first step was to telegraph \$25,000 gold to Mr. Shea of the American Trading Company at Kobe for the urgent relief of American destitute who had flocked to that port from every point in the danger zone. Unless further disbursements have been made from this fund since the middle of October, a large part of it remains unexpended. It was more than ample for every need. Long before actual funds had been placed at the disposal of General McCoy he had employed his own and those of his staff to assist Filipino refugees, and when these gave out and he explained his predicament to Mr. Lynch, manager of the Tokyo branch of the International Banking Corporation, the latter sent him a check book and told him to go the limit, he could have all the ready cash in the vault. This, at a time when the Japanese banks were doling out cash in very small amounts. Every American or Filipino

who applied to General McCoy or the Red Cross for funds to defray their expenses to the homeland, were assisted. In such cases where the person had private means at home they promised to repay the money to the Red Cross Society on arrival or within a given time after reaching their destination. Those who could not give this assurance were made a present of the money. The Pacific Mail, the Admiral line and the Canadian Pacific liners which touched in Kobe and Yokohama during the fortnight following the disaster carried many destitute Americans and foreigners across the Pacific on their promises to pay.

While the work of assisting Americans at Tokyo was going on, the harder, more gruesome and heart-breaking job of recovering, identifying and burying the dead at Yokohama was carried forward by Consul-General Johnson and Vice-Consul Wright. Pending the arrival of the army transports *Merritt* and *Meigs*, an American station ship, served as a free hotel and office headquarters for those American business-men who, after seeing their families in a place of safety, returned to Yokohama to salvage their safes and documents of value and hold their trade connections. A camp furnished by the army was subsequently erected on the grounds of the consulate to serve as a free home for Americans who had business in Yokohama. The navy provided free transportation from to Yokohama for these men. At all times from the day after the quake, the first and foremost thought of the ambassador and his staff, Admiral Anderson and his fleet officers and General McCoy and his army assistants, was the welfare of their own countrymen, and to this end every rule, regulation and precedent in the state, war and navy departments was broken and set aside in order to bring prompt and efficient relief to their own countrymen.

There was only one thing that the representatives of the American government and the Red Cross Society could not do. They could not reimburse Americans for their losses nor provide them with the funds to resume business. Every other measure of relief was anticipated and spontaneously extended, and if at this late date, there are some Americans who feel aggrieved because the millions contributed for relief were not handed over to re-establish their business, it was simply because these things are not done. The millions raised by the Red Cross Society of America came as the result of a direct appeal on the part of the president and the whole-hearted response of the people of America to the needs of a nation whose dead, wounded, homeless and destitute had a greater claim to their charity and sympathy than the urgent business requirements of their own countrymen.

It is true that many Americans suffered equally with the Japanese and deserve special assistance from their government in order that they may quickly resume business. The property of most of these Americans was duly insured and where such risks were not specifically covered by an earthquake clause they face a most difficult and obscure future. It is not easy to formulate measures that may serve as precedents for governmental assistance in restoring private property losses arising from acts of providence, as every year witnesses some fresh and unexpected catastrophe at home or abroad equally disastrous to Americans residing in or conducting business in the stricken locality. With few exceptions, American firms located in Yokohama occupied rented office space, and all of these immediately transferred their headquarters to Osaka or Kobe, which brought them into closer touch with the industrial centre of Japan and the actual purchasers of their products. In

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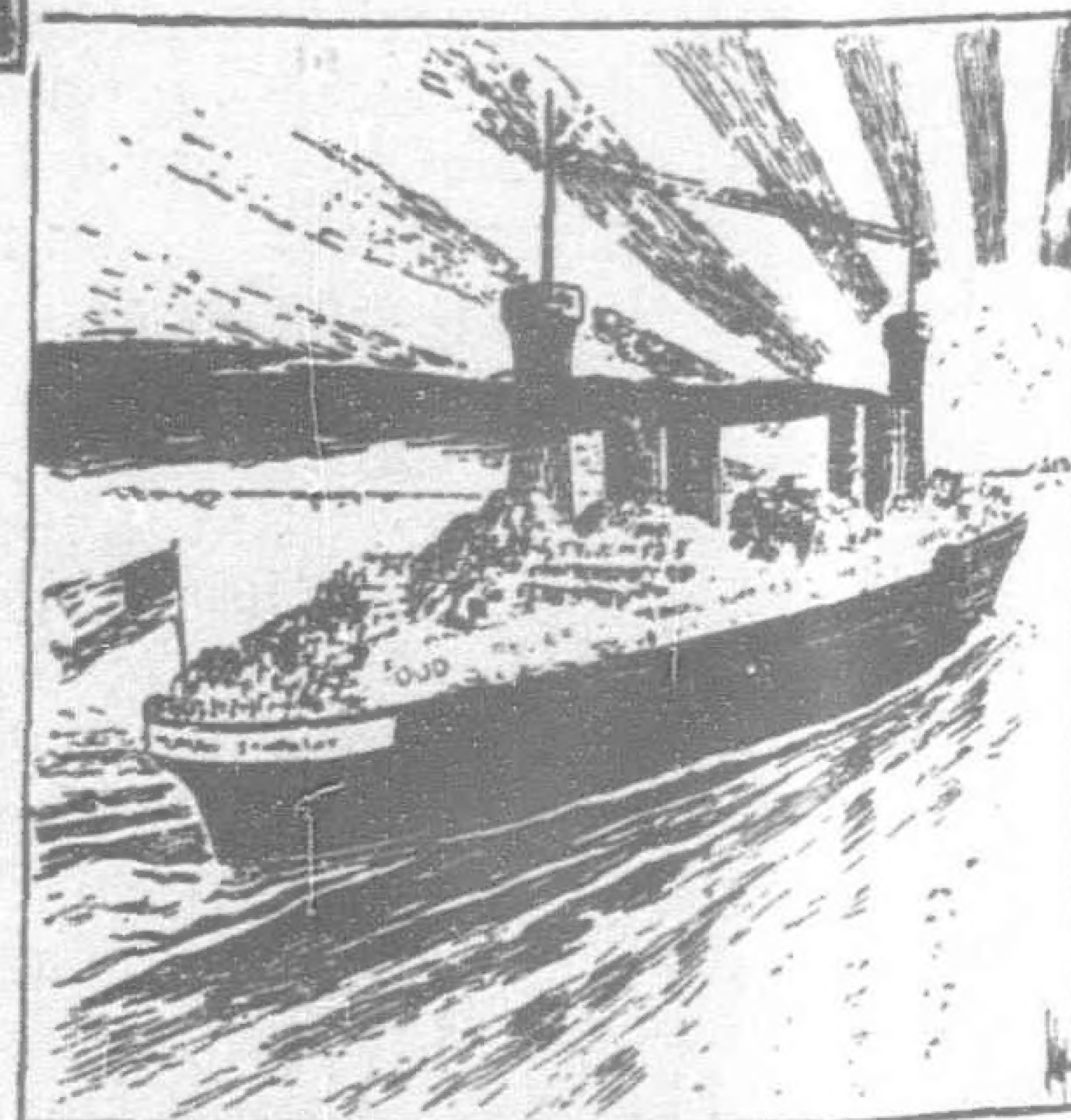


ADMIRAL E. A. ANDERSON

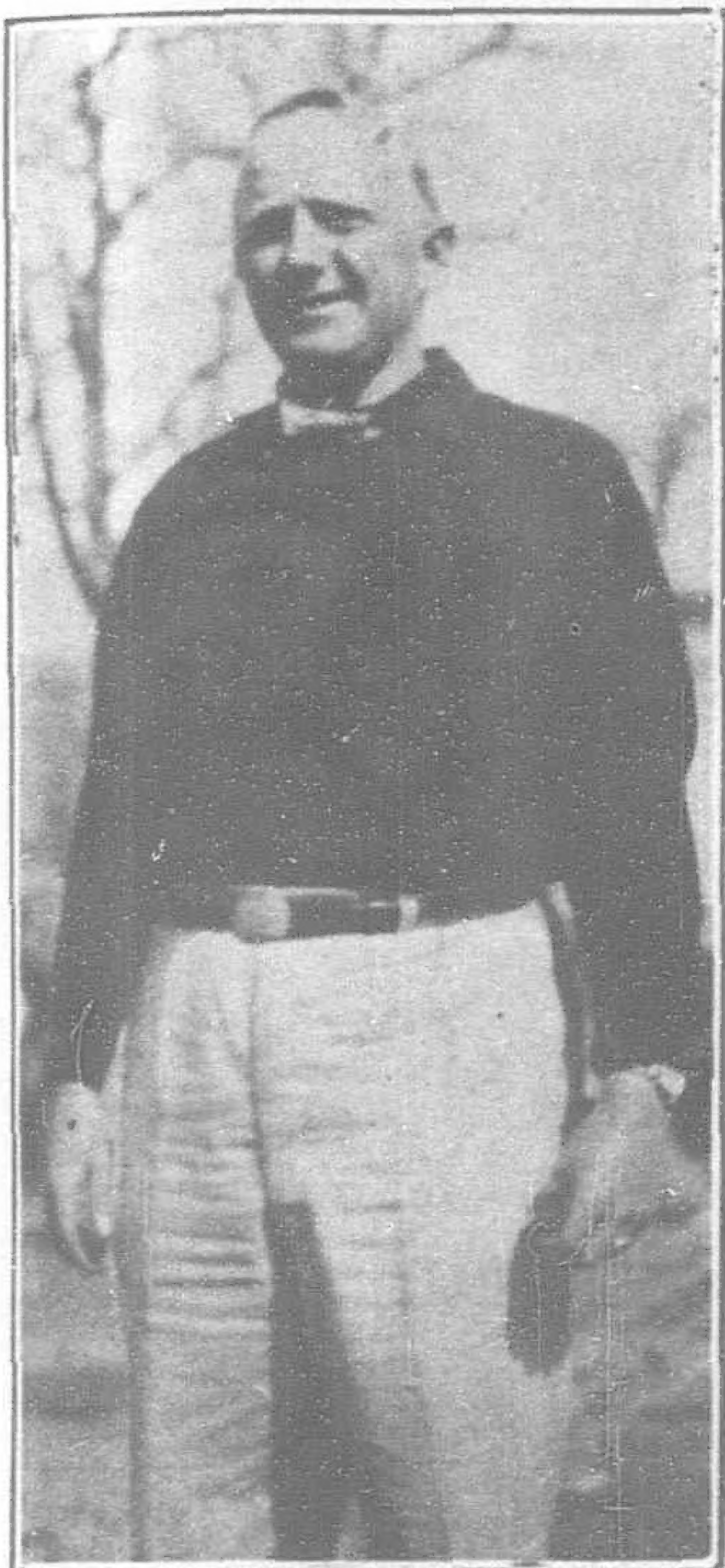
Former Commander-in-Chief of the American Asiatic Fleet

ADMIRAL ANDERSON learned of the disaster at Chefoo, the summer rendezvous of the fleet in North China. Without awaiting instructions he ordered the supply ship *Black Hawk* to proceed to Tsingtao to load with provisions and relief supplies, sent similar instructions to every American naval supply ship on the station and authorized the naval purchasing officers at Shanghai and Manila to make the necessary purchases. After compromising the navy department to the expenditure of over \$2,000,000, he proceeded under full steam towards Yokohama to place the entire American fleet at the disposition of the

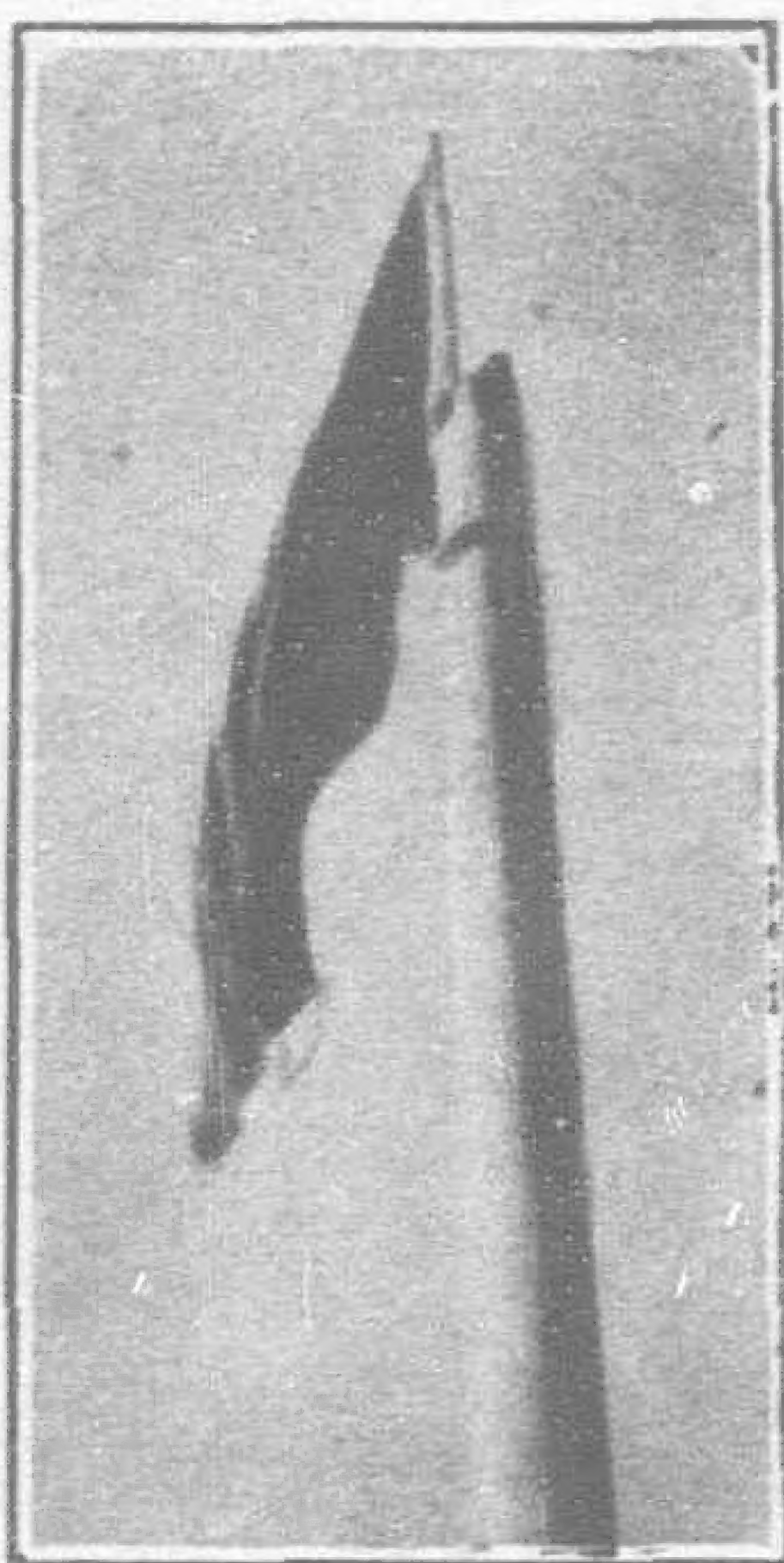
Japanese government. His action was fully supported by the navy department at Washington who cabled him to "go the limit." After the first rush of relief work was over and foreign refugees had been transported from the devastated regions to Kobe or placed aboard steamships bound for home, the American fleet quietly withdrew and returned to China. Within a month, Admiral Anderson was due for retirement, ending a splendid career with one of the most brilliant exploits in the history of the American navy, a victory for peace and good-will that will have a greater bearing on American prestige in the Pacific than any triumph of naval strength. The American army followed the navy in rushing relief supplies to Japan rounding out the campaign that has resulted in bringing together America and Japan in bonds of complete understanding. The navy, however, took the lead. To Admiral Anderson belongs the credit.

How the American Fleet Rushed to Japan.  
(From the "Columbus Dispatch")





Consul-General-at-Large Nelson Johnson, who reopened the Consulate at Yokohama, identified and buried the dead, blew open safes and conducted a camp for American refugees and business men.



Captain David Tait, an American newspaper man and reserve officer of the Army, who directed the Relief transportation.



### THE AMERICAN EMBASSY RELIEF ORGANIZATION

Ambassador Cyrus E. Woods, in the only suit of clothes saved from the fire.

Major Faymonville, Assistant Military Attache.

Lt.-Col. Charles Burnett, American Military Attache.

Top Centre: "Old Glory" flying from the charred top of the Embassy flagpole at Tokyo

Centre: The Ruins of the Embassy.





Mr. H. Saito, of the Foreign Office, Assistant to Mr. T. Sakai, in charge of Japanese Relief Measures. Mr. Saito has since been promoted to the post of Consul-General to New York



Baron Ijuin, Minister of Foreign Affairs, and Brigadier-General Frank S. McCoy, at the American Hospital in Tokyo on the occasion of turning it over to the Japanese Authorities.



Ambassador Woods and Gen. McCoy.



Mr. Frederick Moore, a well-known American Journalist, now Councillor to the Japanese Foreign Office, whose advice materially contributed to the successful outcome of the American Relief Mission

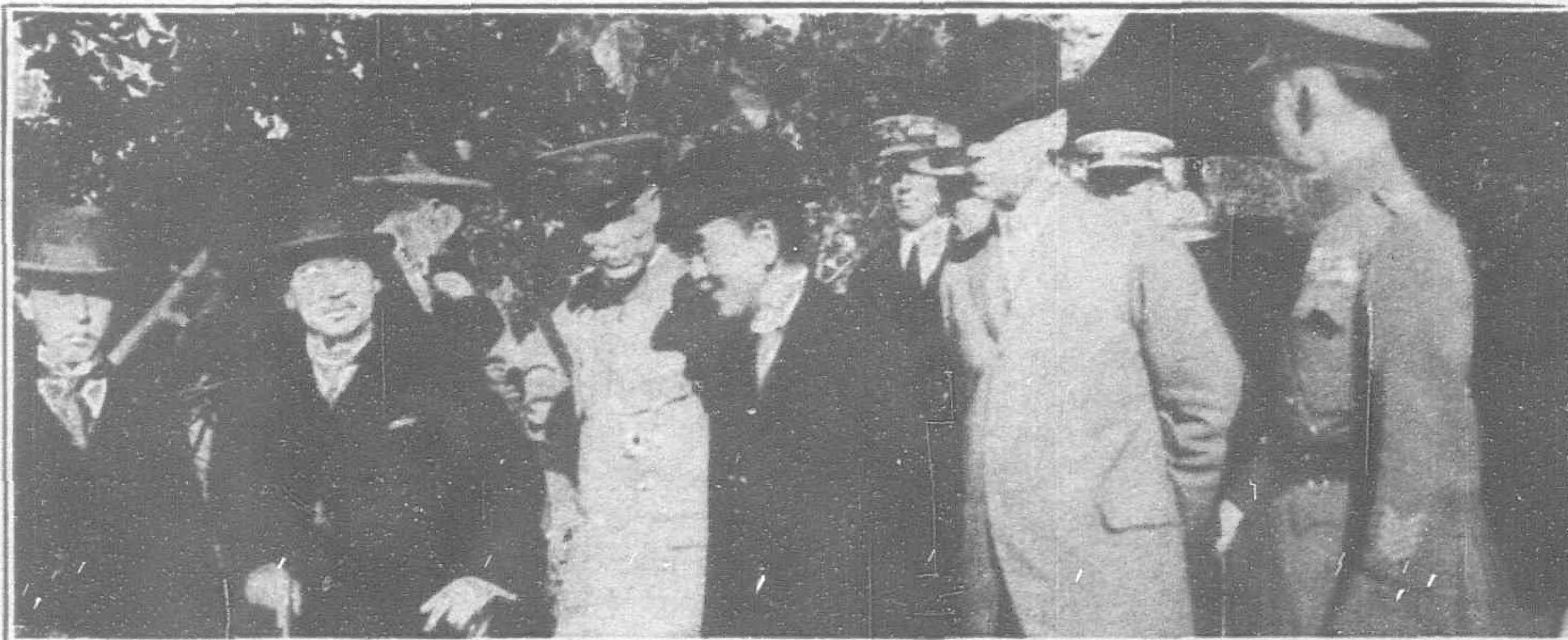


Colonel George T. Langhorne, U.S.A., Assistant to Gen. McCoy on the Japanese Relief Mission,



Mr. O. Matsukata, youngest son of Prince Matsukata, an able Assistant to Mr. Sakai in handling the Japanese end of Relief Activities.





Turning over the American Army Hospital in Tokyo to the Japanese Government.  
Right to Left: Gen. McCoy; Ambassador Woods; Baron Ijuin; Vice-Minister of Army.



#### AMERICAN AND JAPANESE RELIEF HEADQUARTERS STAFF

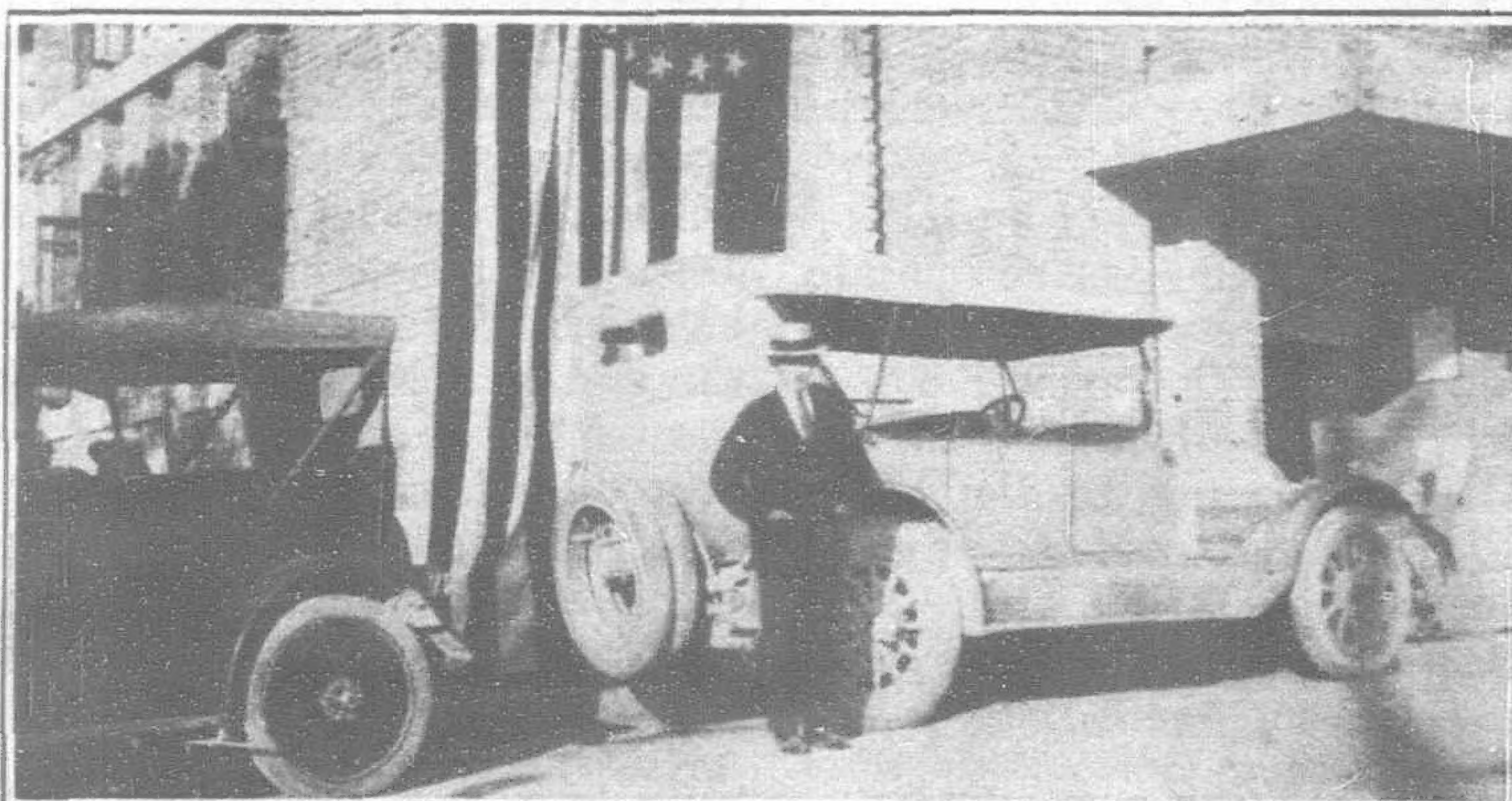
Right to Left: E. W. Mills, of Peking, assistant to Gen. McCoy; General Frank S. McCoy; Colonel Samuel Reber; Mr. T. Sakai, Director General of the Japanese Relief Bureau; Dr. Goto, of the Japanese Red Cross; Frederick Moore; H. Saito; Lt. Honda.  
Seated: G. B. Rea and Colonel Geo. T. Langhorne.



Colonel Samuel Reber, Representative of the Radio Corporation of America, a most efficient officer who straightened out the radio tangle.



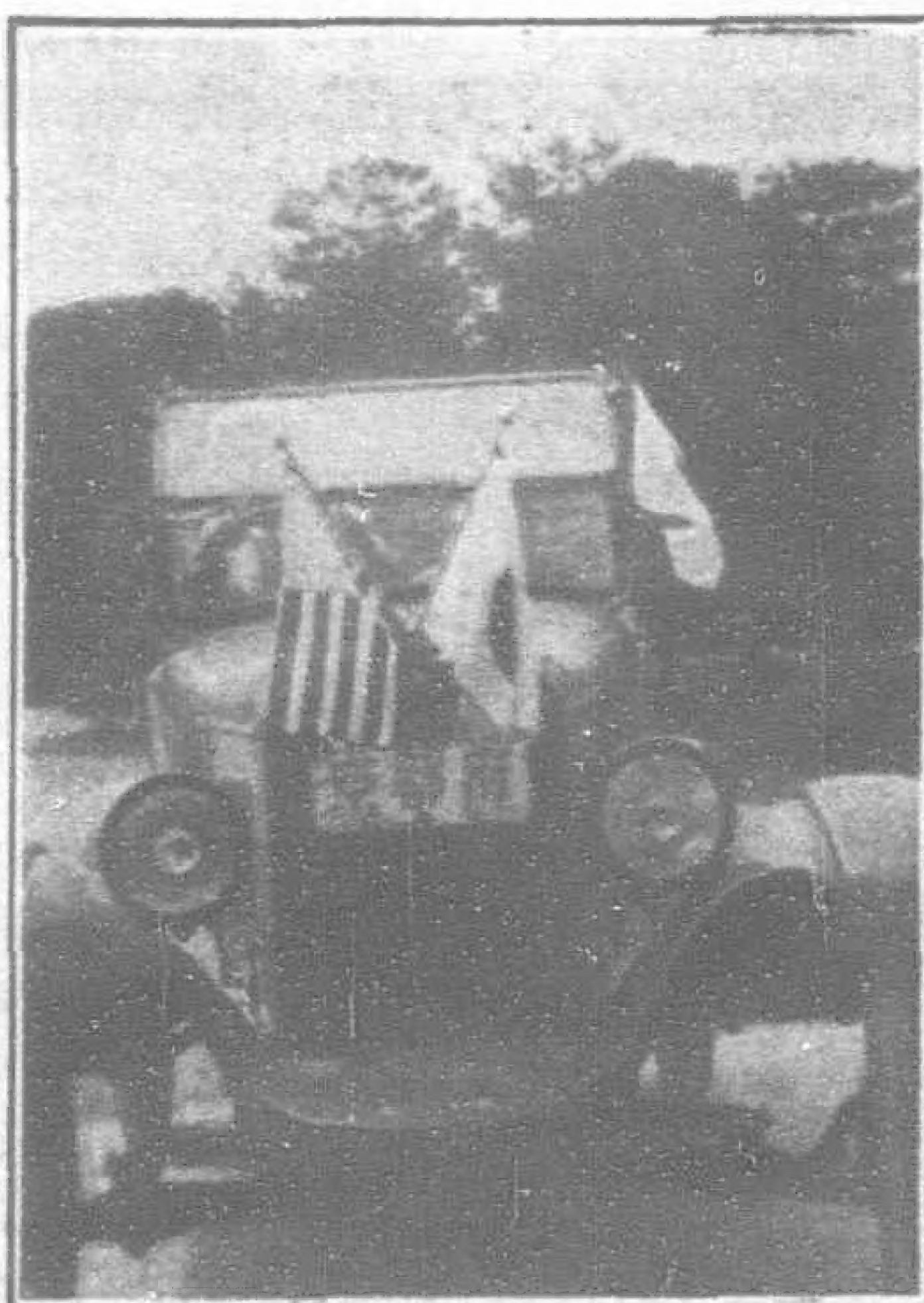
Lt. Colonel Hands, of the Artillery, in command of American Army personnel who erected the hospitals at Yokohama and Tokyo.



American Embassy and Relief Headquarters in Tokyo at the Imperial Hotel



Captain Fletcher, of the U.S.S. "Sacramento," and Lt. Comdr. Zacarius, naval language officer attached to the Embassy.



Relief Car



Lt. Hasboeck, of the Army, and Jr. Lieut. Merrell, of the Navy, Aides to Gen. McCoy.



## AMERICAN RELIEF WORK IN JAPAN

(Continued from page 677).

many instances, the change will benefit their business. Most Americans doing business in Tokyo having their offices in the Marunoichi district face the future building boom prepared to get their share of the orders. On the other hand, those who owned properties in the devastated districts have little hope of recovering on their insurance policies, though we have heard of some with earthquake clauses on which they paid a higher premium, who are not worrying about the future.

Notwithstanding these losses, I have never seen a more genial, smiling and determined group than these same Americans who accept the situation in the same spirit as the Japanese, full of faith in the ability of the empire to pull through and confident of recouping their losses by dint of hard work and close attention to business. One hears no complaints from these men about the lack of consideration on the part of their government, no carping criticisms on the generous response to the needs of the Japanese or comments on how the Japanese comported themselves during their hour of trial. These men are sane, sensible and have the vision to see that the sentiment which prompted their countrymen to contribute millions for the relief of Japan is just so much capital invested in good-will in their own business, on which they will draw handsome dividends

in the future. These men may be temporarily handicapped, but they are not alone. They face the future on the same footing as their Japanese colleagues, richer than ever before in the esteem and credit of those they must live and do business with.

American trade with Japan will not suffer by any failure on the part of the American government to extend financial or other assistance to enable its merchants to re-establish themselves in business in Yokohama or elsewhere in Japan. A few small firms may be wiped out, but those who have their roots firmly embedded in the country and do the bulk of the business will survive, while the losses of the few will be more than equalized by the increased volume of orders that will pour into our manufacturers through Japanese firms having their own branch offices throughout the United States. The unprecedented popular ovation that was given to Ambassador Woods on the occasion of his recent departure for America can be appreciated only by those who have lived a life time in Japan. The deep gratitude and cordial friendship which animated the thousands who thronged the great square in front of the Tokyo central railway station to honor the representative of the United States, is only a very small part of the capital on which the American merchant has to draw on in his future business relations with the Japanese. Only narrow-minded, or solid-ivory-domed Americans refuse to understand its meaning.

G. B. R.

# Shall America Co-operate with Japan?

**U**NDER the above caption this magazine printed an article signed by its publisher in March, 1920, which called forth the public resignation of its editor, the scathing denunciation of a contributor who runs the Chinese government as a side line to his journalistic activities and provided the opportunity for a venomous little anti-Japanese weekly purporting to reflect American official opinion to launch a business boycott against us. However, we have survived the campaign to "put us out of business" and once again propound the query: Shall America co-operate with Japan?

*Yes, America will co-operate with Japan.* The answer comes direct from Washington voiced through its ambassador to the court of the Mikado. The pendulum has swung to the other extreme and where three years ago officials of our government opposed any suggestion looking towards co-operation with Japan and joined in the persecution of those who held other views, now heartily endorse a doctrine which has become the policy of the administration.

Ambassador Woods came to Japan with one object in view. A big, broad-minded man of affairs, he realized that the one guarantee of permanent peace in the Pacific, the one hope that the Washington treaties would be extended on their expiration, and the understanding with Japan expanded into an enduring friendship lay in creating business partnerships and closer financial relations and co-operation between the two countries. One day in Madrid, conversing with the German ambassador, the latter ventured the opinion that Germany had committed a serious blunder in failing to encourage and build up those close business ties with America which united America and Great Britain, to the point that it was difficult at times to understand where the interests of one ended and the other began. "Had Germany" he said, "followed this program, America would never have entered the war against us." He was mistaken in this view, but the fundamental truth was so sound that when asked to take the Japan post, Mr. Woods determined that the doctrine should guide his diplomacy in bringing America and Japan closer together. His views were fully endorsed by the president and the secretary of state and when he departed from Washington he carried instructions completely reversing the policies of the past decade and paving the way for that closer understanding which will lead to a new and different outlook on Pacific problems.

When Ambassador Woods arrived in Tokyo in the early part of August, he placed his ideas before a gathering of Japanese businessmen who honored him with a tiffin at the Bankers' Club in that city. The sudden change from polite attention given to the perfunctory diplomatic compliments which inevitably precedes such discourses, to one of lively interest when he touched on the subject nearest his heart, encouraged him to proceed and expand his views. The roar of genuine and heartfelt applause which followed and the congratulations showered upon him by every Japanese present told him that his message had gone home. Ambassador Woods did not know at the time that his mission came as the end to a long drawn out and bitterly contested campaign on the part of these same Japanese business-men to bring about the very thing he so fervidly advocated.

These same group of Japanese business-men had long realized the strength of the bond which united America and Great Britain, and that the one obstacle to the attainment of the same close co-operation with their own country was the suspicion created in the minds of Americans by unreasoning propaganda that such co-operation might be employed to advance their special interests in China. It was due as much to the influence and pressure of this same group that the policy of their government towards China was radically modified in order that no barrier could stand in the way of a complete understanding and close friendship with the United States. Little could be done towards eliminating friction with America, however, while the agitation against Japan in China was at its height. When these points were cleared up at the Washington conference and American confidence restored in her sincerity, the road was open to an amicable adjustment of her differences with China. Japan's policy towards China is now fixed. She stands squarely on the terms of the Washington treaties, the champion of China's unimpaired sovereignty and administrative independence. There is every reason to believe that within the next year all past differences will disappear and trust and friendship supplant suspicion and ill-will.

With Japan adhering to this unalterable program and America willing to aid in the exploitation of her domestic resources and industries and extend this co-operation to the development of Manchuria and Korea the door is now open for a wider application of the new doctrine. The first step towards this end was taken in the approval by the state department to the National City Bank



loan to the Oriental Development Company for industrial and agricultural development in Korea and Manchuria. There are other schemes for the exploitation of these regions projected by Chinese and Japanese in which there is no good reason why American capital should not find safe and profitable investment. Manchuria is the Land of Opportunity, the Country of To-morrow, an empire in the making, the granary of Eastern Asia, the last frontier of the cattle man; a possible Klondyke. While the rest of China remains at a stand still, torn asunder by civil strife and overrun with bandits, vast schemes are being projected and carried out in Manchuria under the initiative and enterprise of the Japanese. The new iron ore reduction process invented by one of the engineers of the South Manchuria Railway Company will revolutionize the iron and steel industry and we now learn that a super-hydro-electric power plan has been prepared that will dam the Yalu and its mountain tributaries at various points and provide ample power to operate not only the industries established or projected in Manchuria but all the railways in that province and a large

part of Korea. If these plans are carried out, Manchuria will become the manufacturing centre of the Far East. Surely, this is a brilliant opening for Sino-Japanese-American co-operation on a large scale, carrying as it does the essential guarantees for protection and stability not yet discernable in other parts of China.

The day of kicking Japan in order to curry favor with or extract subsidies from a group of Chinese politicians is past. The policy of Japan towards China coincides with that of the United States. The American government has declared for co-operation with Japan. The new policies of both countries will prove of great benefit to China, who enters the combination as a full partner when enterprises in Manchuria come within the scope of the doctrine. The application of this working agreement to Manchuria under the Washington treaties is the surest guarantee that China's sovereignty in those regions will be safeguarded and the road cleared for industrial development and a trade boom unprecedented in any part of the world. The development of Manchuria under such guarantees will parallel the winning of the American west.

## Japan, the Friend of China

IT does not require a keen insight into Chinese psychology to understand that in clamoring for intervention, strong action, reinforcement of military and naval forces, railway police, and the many other remedies advocated from time to time as a panacea for China's domestic ills, Americans and Europeans are undermining their own position with the Chinese while the latter are more and more turning towards Japan for sympathy and diplomatic support. It is only a question of time, and not very far off at that, when Japan will once more regain the full confidence of China, while those who have enjoyed her friendship and trust will see their influence and prestige wane and faith in their sincerity turned into suspicion and ill-will. The over-harsh demands of temperamental Americans for drastic intervention, fortunately unheeded by Washington, were more or less supported by local British sentiment. A campaign was launched to bring about exclusive Anglo-American co-operation for the same purpose, followed by a petulant outburst from a very small but extremely vociferous coterie urging the United States to take immediate and independent action, in order, so they said, that America would maintain the lead in Far Eastern affairs gained at Washington. On the part of the French, there was no scramble to obtain a seat on the Anglo-American band-wagon, as in these matters they can well afford to remain quiescent and permit others to pull the chestnuts out of the fire. Those who advocated the creation of a foreign-directed railway police as a protection against bandit attacks upon the railways believed it would result in increased British and American prestige, overlooking that French capital far exceeds that of any other country or combination of countries in the construction of existing Chinese railways. The money for all the Russian lines, sixty-five per cent. of the Belgian and forty to fifty per cent. of the British-built railways was raised in the French market and the bonds are still held by French investors. The claims of the French to control the new organization, if vigorously pushed, would have to be recognized by other interested powers or invite opposition and the selection of a neutral.

As a counter irritant to the Anglo-American co-operative movement staged in China, a group is forming in Paris for the purpose of extending the Anglo-French understanding to this country along lines diametrically opposed to the strong action of the Anglo-American program. The French, as well as the Japanese, have been quick to take advantage of the mistakes of Americans. M. Roger de Belleval, editor of *La Revue Pacifique*, uses this situation as the basis of a call for Franco-British co-operation in the Far East. "Intervention," he says "was nowhere more unpopular than in the United States, nowhere is it now more insistently demanded." The French incline to the view that intervention, if necessary, must naturally take a prudent form. M. de Belleval says:

"England and France cannot go on indefinitely allowing their nationals to be maltreated; nevertheless, it is the duty of both powers to counsel moderation at Washington.

"The Chinese people are very jealous of their independence. It is vital that action by the powers should always remain within the bounds of true neutrality, which is, in fact, the only real safeguard. No matter at what cost, they must never take sides, or they will mobilize the whole Chinese nation against them.

"The psychological factor has always to be taken into consideration. Men's characters change. It may appear useful to lend support to a chief for a time, but afterwards it is regretted, and the policy embarked upon has in the end done more harm than good. And if individuals are unstable, how much more so is public opinion. A chief may be popular for a time, and his influence may appear great, but how soon does this popularity disappear, often without any apparent reason! Moreover foreign support often causes a man to lose what influence he has in his own country. We may admire a chief for his capacity in keeping order, but if we give him assistance, that very fact ruins his authority with his own people, and chaos ensues.

"The policy that is needed must therefore combine energy and prudence, perhaps the most difficult procedure of all. Who will control this policy? Clearly it cannot be one power only. The Chinese people would never brook such interference. Accordingly intervention must be undertaken by a combination of powers acting together, to the exclusion of all individual action. It is clearly indicated that this combination should consist of England and France. They have both an excellent title to it. They are not new-comers in China, like the United States, they are not deeply involved, as is the case with Japan. Both powers have great interests in China, not only commercial, but also moral and intellectual. France, in particular, can point to her missionary work, which entitles her to a hearing. Moreover, since the collapse of Austria, England and France are the only two old nations that remain which are able to carry on a foreign policy consistently without constant interruptions from criticism at home. They have been able to prove to the world that political crises can be handled coolly, and also shown the wisdom of suspending judgment until the opportune moment arrives. There are, therefore, many reasons why these two powers should combine to make their influence felt in China, but the most important is the need for Anglo-French co-operation in every possible field. It would serve to relegate the Ruhr problem to its proper position, as an exceptional episode in the relations of the two countries, rather than what it is regarded as now, a disquieting symptom of disagreement and estrangement. During the war the *entente* between the two nations was perfect, because it was directed to the same ends. In the future let us seek for work we can do in common, for through working together we shall also come to agree together."

Americans who believe that their country is called upon to be the savior of China by reason of their commercial, philanthropic, educational and religious activities will probably be surprised to learn that French writers base their right to leadership on old established moral and intellectual interests arising out of their missionary activities. It will also come as a surprise that any plan for foreign control based on the volume of capital invested might also swing this leadership to a nation, who, because of its pre-occupation with other more important questions, has had the least to say about what should or should not be done to restore stability to this country.

There is only one obstacle to perfect Anglo-French co-operation in the Far East, the same obstacle which influenced Great Britain to oppose French occupation of the Ruhr. When both nations realize that there is no profit and much loss in opposing each other in Near Eastern territories where neither are wanted and where both are being played off against each other, it is possible that a more harmonious understanding may be arrived at in regard to China.



As long as the French in Syria continue the intrigue which precipitated the downfall of British prestige at Constantinople and stir up the Beduins and tribes in Inner Arabia against Hedjaz, Transjordan and Iraq, frustrating British imperial designs in this section of the world, there is little hope that these two nations will work together in other parts of Asia. An extension of the Anglo-French *entente* to the Far East must necessarily lead to an abrupt termination of the Anglo-American copartnership in this country and the drawing together of America and Japan.

As long as other foreigners continue to demand drastic action for the protection of their interests in China they are simply hastening the day when Japanese influence will once more predominate at Peking. The policy of the American government (as opposed to a minority of its nationals in this country) and that of the Japanese government is identical. Both are determined to live up to the full letter and spirit of the Washington treaties and permit China to work out her own salvation without outside interference or pressure, even if it takes years and injures their own commerce. Only on the express invitation of China herself, will these two powers consider any variation from this program. No amount of pressure can influence Japan to depart from the basic policy laid down originally by the Hara cabinet, and had it not been for the agitation and boycott over the Kwantung issue, by this time the two peoples would have solved their differences and resumed close relations. Every move made by other powers or their nationals to break down or impair the Washington treaties provides the opportunity for Japan to strengthen her position, and should independent action be taken that would contravene these treaties, the power or powers taking such action would face a united China supported morally and materially by every force that Japan can command.

Japan, to-day, is acting solely in accordance with its own interests and will not be led away from its policies by the actions of other powers. Japan has set out to gain the good-will of the Chinese. Never before in the history of the Japanese nation has the policy of its government and the opinion of its people with regard to China coincided as at present. The Japanese believe that with the solution of their internal troubles the Chinese will be able to settle all foreign complications and if left alone they have the ability to unify contending factions without foreign interference. They also believe that it is Japan's duty to protect China while she is passing through this crisis in her history. Japan will live up to her present determination to refrain from supporting any one faction or party and work for unification as the first step to bring peace and prosperity to her neighbor. The Japanese hold, and rightly, that Chinese affairs are for the Chinese themselves to consider and solve and not a matter for foreign intervention. The Japanese people persistently encouraged their government to oppose the plan for enforcing a foreign directed railway police on China and succeeded in having it modified. Japan will make no move that might in the most remote manner be construed as an aggression or an impairment of China's sovereignty or a wound to its pride. When the time arrives in the future, the one outstanding question that remains to irritate the Chinese, the Kwantung lease, will be dealt with in a manner that will take it out of the arena of international politics.

At the head of the gaimusho, or foreign office, stands a man known to the Chinese as their friend, a statesman who has played a prominent part in formulating the present policy of his government. Since the Paris peace conference he has taken the lead in working out a program for better relations with America and a complete revision of Japan's attitude towards China. His efforts have been crowned with success in the United States and Japan is now well on the road towards a *rapprochement* with China. Japan's policy is fixed and without her approval it will be difficult to put into operation any of the plans so freely advanced to place China on her feet through outside help and against her wishes. Every move, every resolution, every plan advanced that in the least impairs the provisions of the Washington treaties, will meet with the disapproval of the administration at Washington which stands or falls on its record in bringing about these guarantees to China's sovereignty. In like manner, every such move will be blocked by Japan, who will go to the extreme of aligning herself with China in case the latter's rights are further impaired. And as the nationals of other powers continue to demand further encroachments upon China's sovereignty, she will turn more and more towards Japan for aid and comfort, with the full assurance that it will be forthcoming.

## The Red Side of the Disaster

IT is unfortunate at this time that further anti-Japanese feeling is being aroused in China over the reports that a number of Chinese were killed by the so-called vigilance committees organized in Japan immediately after the earthquake for the protection of the towns and villages against Koreans and reds. There is no denying the fact that Japanese mobs in several outlying towns lost their heads and committed acts of violence on a large number of innocent refugees fleeing from the horrors of Tokyo, under the supposition that these unfortunates were the vanguard of Korean anarchists bent on burning, looting and wrecking vengeance on defenseless country communities. It is difficult to explain, more difficult to excuse and still more difficult to atone for the cruelties which blackened the story of the great catastrophe at a time when all the characteristic good qualities of the Japanese came to the surface and earned the applause of the entire world.

It is, however, easy enough to understand the state of mind of a people who have learned to look upon the Koreans somewhat in the same manner as a generation ago the English did the Fenians, the Russians the nihilists or Americans the I.W.W. Ever since Japan has occupied Korea, the Japanese people have repeatedly been horrified by tales of assassinations, bomb explosions and revolutionary plots in which Korean malcontents figure as principals, and the public mind intuitively associates them with every political murder, conspiracy against the state or other activities which keep the police in a constant state of alarm. The assassination of Prince Ito, the murder of Mr. Stevens, the recent attempt to shoot down General Tanaka at Shanghai (resulting in the death of an American bride touring the world with her husband on their honeymoon) the long line of bomb outrages and revolutionary uprisings in the Land of the Morning Calm have got on the nerves of the Japanese to a point where they are ready to believe the Koreans capable of committing any crime in order to register their hatred of Japan. It was only natural when the quake set free the prisoners from the Negishi prison at Yokohama at a time when all police restraints were removed that the hardened criminals would take full advantage of their liberty to murder and loot. It was also natural that the reds, and there are many in Japan, would seize the opportunity to forward their own plans to precipitate disorder and utilize the occasion to shift the responsibility to the shoulders of others. Many Koreans are used by the reds, to forward their propaganda in Japan, and it was easy for the latter to cover up their own activities by placing the blame on their misguided dupes. The cry against the Koreans, as far as can be ascertained, started at Yokohama and in the Yokosuka district where a large force of Korean laborers were employed in railway construction and the word was carried like a flash all over the empire that the Koreans had banded together to loot, murder and burn. The Japanese living outside the big centres knew the Koreans only by reputation and as the first truck loads of unfortunates fleeing from Tokyo passed through the towns of Saitama prefecture they were seized by the mob of self-constituted vigilance committees and young men's associations and despite the efforts of the police to protect them, were ruthlessly massacred. There may have been some Koreans amongst these victims of mob ferocity, there may also have been a few Chinese, with here and there a foreigner who was roughly handled, but the evidence which has come to light since those terrifying days immediately following the catastrophe, shows that the great majority killed by the terror-crazed mobs were their own countrymen.

It is a picture which no one cares to dwell upon, least of all the Japanese themselves. Those peaceful and inoffensive Koreans killed by the mobs paid the penalty of years of outrages perpetrated upon the Japanese by the worst elements of their own country. The criminals of Yokohama and the reds of Tokyo knew their own people and with devilish intent diverted popular rage from their own misdeeds to those the public were all too ready to accept as desperate characters. There is no other explanation to an episode which darkened the otherwise bright picture of supreme heroism, self-sacrifice and deeds of human kindness which characterized the Japanese people at a time when all law, order and government were at a standstill and self-preservation overpowered every other instinct.

There is ample evidence to support the charge that the reds instigated the movement against the Koreans and hailed the disaster



as a providential opportunity for furthering the revolutionary movement. A soviet propaganda ship, well named the *Lenin*, was fitted out hastily at Vladivostok and dispatched to Yokohama carrying physicians, nurses and supplies for the relief of the "Laboring classes only." In her hold was also safely stowed a few tons of revolutionary propaganda literature. The captain had the consummate nerve to convey this information to the Japanese officials who boarded the vessel on her arrival. Soviet Russia calmly calculated how the agony of a stricken people could be turned to political account and felt aggrieved when the Japanese very properly refused to permit their bloody propaganda to be concealed under the mantle of charity. The captain of the *Lenin* was directed to make all reasonable haste in removing himself, his boat, his supplies, his doctors and nurses from Japanese waters and a warship stood by to speed him on his return voyage. Bolshevik propagandists ordered by Moscow to hurry to Japan by other routes were detected and turned back by the police. People who will descend to such tricks and methods to incite revolution at such a time are fully capable of setting the mob on to innocent people in order to arouse the blood lust.

It may be true, as alleged, that some Chinese, unable to satisfy the vigilance organizations of their identity, were mistaken for Koreans, it is also entirely probable that others were murdered in Yokohama by criminals bent on looting, but it is equally certain that no one regrets such occurrences more than the Japanese people at large and their government. One of the outstanding features of the great catastrophe was the immediate reaction of the Japanese to the dispatch of stores, medicines, red cross units and money from China and the abrupt cessation of anti-Japanese activities on the part of the students and political agitators in this country. The feeling of profound gratitude on the part of the Japanese for the unexpected and spontaneous sympathy shown by China eliminated all bitter feelings engendered as the result of years of political misunderstanding. From the very first measures for general relief, even before they had heard about China's generous contributions, the Japanese government created a special bureau and organization to succor the Chinese sufferers residing in the devastated regions. It is within our personal knowledge that Mr. Debuchi, chief of the Asiatic bureau of the foreign office, left no stone unturned in order that immediate relief and protection be extended to the Chinese. Owing perhaps to the larger American and other foreign relief activities which monopolized publicity, adequate recognition was not given by the press to China's prompt response to Japan's mute appeal for help, or to Japan's equally

prompt reciprocal steps to ameliorate the sufferings of Chinese victims of the disaster.

A special fund was set aside for this purpose. Several thousand Chinese were collected and cared for in specially prepared camps while over 3,000 were provided with free transportation on Japanese ships to their own country. They were clothed, fed and in some instances provided with money. In fact, every possible attention was shown them at a time when the Japanese homeless and destitute were crying for clothing and food and had the first claim on their own authorities. Mr. Debuchi took personal and active charge of these matters while the army, navy, police, red cross and steamship companies co-operated with him at all times to impress upon the Chinese refugees Japan's real friendship and solicitude for their comfort and well-being.

In the midst of their own sorrow and loss, the Japanese government officials and leaders of public opinion, even to the man-in-the-street, were as one in hailing the opportunity presented by the disaster to clear away misconceptions surrounding their attitude towards the Chinese. If the latter were subsequently shocked to learn that some of their countrymen had fallen victims to mob violence, the allegation brought consternation to the Japanese, and no time was lost by the government in expressing its sorrow and making proper apologies through its minister at Peking, at the same time starting an investigation to determine the truth of the charges and fix the responsibility. The new epoch in Sino-Japanese relations so fervently hoped for on the part of all classes in Japan is set back temporarily by this unhappy incident. Some Chinese, ignorant of true conditions during the days following the quake, are now advocating retaliation, using the incident to keep alive political strife and the boycott against Japanese goods. The Japanese government is conducting a searching inquiry and if the allegations are supported by the evidence, ample reparations will be cheerfully and spontaneously forthcoming.

The Japanese people as a whole are sternly demanding the facts and if the charges are proven, full satisfaction will be given the people of China, the families of the injured or killed compensated and the guilty properly punished. If such incidents occurred it was through no general anti-Chinese feeling on the part of the Japanese, but traceable solely to the extreme terror inspired in the hearts of the simple-minded credulous country people by stories scattered broadcast by the reds and criminals that the Koreans were coming to massacre them.

G. B. R.

## Technical Education in China

THE following contributed article to *The Engineer* is of special interest to Americans at a time when the China society of America is using its best endeavors to have young Chinese student graduates from American colleges supplement their training by practical experience in American industrial establishments and technical offices. While heartily approving any plan that will provide that practical training so essential to the efficiency of the technical graduate, we incline to the belief that until Americans carry their philanthropy further and provide the capital for the creation of industries in China that will open the door for the employment of their protégés, they are simply adding to the already large number of unemployed and dissatisfied Chinese technical men who decline any work other than a comfortable desk job.

The contributor to *The Engineer* emphasizes this same condition, and maintains that the reason why more of the graduates of the Chinese engineering colleges have not followed technical careers is due to lack of development, or, over-production of engineers. "It is manifestly absurd," he continues "to expect any country to absorb yearly some one to two hundred engineers on a total track mileage of from four to five thousand miles with all the postal, telegraph and navigation services thrown in." Most of the old students of the Chinese official technical schools are looking for jobs. When the hundred or more yearly graduates from American colleges is added to the number of unemployed, the

situation can only be improved by the immediate resumption of railway construction on a large scale accompanied by the creation of technical industries. Otherwise, the continued swamping of the Chinese engineering field by untrained graduates from technical colleges, can only make for a continuation of nepotism and political favoritism if these men are to find an outlet for their usefulness:—

"The more one reads about technical education in China from the pens of Chinese journalists and leader writers, the more one becomes convinced that China will never wake up to face realities, or cease to bow down and pay supreme homage to the god "Face." All that this means to China's millions cannot be expressed in a few short phrases. It permeates the whole of official and private life, with the result that a scheme with a high-sounding name will be assured of support, while any attempt to introduce reforms which aim at putting the fundamental principles right will be met with that passive resistance for which the Oriental is so justly famous. In no department is this tendency more marked than in that of technical education, and it is safe to predict that there are few technical students in China to-day who really believe that there is no royal road to a knowledge of engineering.

"The latest scheme is that put forward by Yeh Kung-cho, who was minister of communications prior to the downfall of his party in the civil war of the summer of 1922. Briefly, there is to be a reorganization and an amalgamation of the engineering department.



Peking University, the Nanyang College, Shanghai, and the Engineering College, Tangshan, to form the Chiao Tung (Communications) University.

"It may be of interest to recall that the Engineering College, Peking, is a combination of two separate schools, viz., railway administration, and telegraphs and posts, and that they came into being in 1917, following the decision to close the training institute of the ministry of communications. The Nanyang College was founded in 1897 by Sheng Kung-pao, then director-general of the China Merchants' Steam Navigation Company, and head of the Imperial Chinese Telegraphs, and was known as the Government Institute of Technology. In 1904 the control was transferred to the board of commerce, but after the revolution in 1911 it passed to the board of communications. Prior to this transfer the College received its funds from the Steam Navigation Company and the Imperial Telegraphs; afterwards it was maintained by an annual grant of some \$130,000 (Mex.) from the board.

"The Tangshan College, considered by some writers to be the best technical institute in the country, was founded in 1905. It started as a railway school, and since that time it has been renamed out of all recognition, successively becoming the Engineering and Mining College, the Railway College, and in 1913 the Special Institute of Industrial Education. As stated above, it now becomes part of the Chiao Tung University. Since it was transferred to the board of communications in 1907, it has received its funds indirectly from the mother railway—the Peking-Mukden line. Tangshan, situated some 75 miles north-east of Tientsin, is the most important industrial centre in North China, and is the centre of the Kaiping coalfield, operated by the Kailan Mining Administration, the weekly output approximating to 80,000 tons. It also contains the Peking-Mukden Railway Works, giving employment to 5,000 men, a large cement works and a modern cotton mill.

"So far as the writer can ascertain, under the new order the Nanyang College will give courses in mechanical and electrical engineering, the Tangshan College will give courses in civil engineering only, and the Peking College will confine itself exclusively to wireless, telegraph and telephone engineering. In addition, a two years' preparatory school is to be established at Tangshan, and a middle school at Shanghai.

"It appears that the amalgamation scheme formed the subject of a memorandum which was submitted to the president, and that the arguments supporting the proposal were based on the necessity of improving the then existing conditions.

Briefly, the defects referred to were:

(1) The duplication of courses, and lack of economy of effort.

(2) The majority of the graduates of the three institutions had gone into various walks of life for which no technical training was required.

(3) The impracticability of the education as given owing to the absence of intimate relationships between the administrative heads of the colleges and the board of communications, the former making no endeavor to ascertain the wants of the latter and to regulate their courses accordingly.

(4) The courses were believed to be not practical enough. The promoters of the scheme claim that the new arrangements will eliminate these defects for the following reasons:—

(1) The board is in a position to know the kind of technical training required.

(2) It will be in a position to give the graduates employment at the end of their technical training.

"A cursory glance at excuses given and proposals made, might lead one to think that the authorities concerned had at last been brought to see the true state of affairs. It is the writer's studied opinion, however, that there is no cause for optimism, and he proposes to analyse the statements made in the light of his engineering experiences in China extending over seven years, three of which were spent as head of an engineering department in one of the government colleges.

"The amalgamation of the colleges is, undoubtedly, correct in principle and may—indeed, should—give the economy of effort and co-ordination required; but to expect such a college reorganization to be the cure for wasted technical talent is to show an ignorance of the facts and a blind disregard of the conditions now obtaining in China. The writer does not believe that lack of co-ordination has ever deprived students of satisfactory theoretical training, or that the instruction given was so inadequate that students who were successful in passing out were not qualified to be offered work on a

remunerative basis by the board. In fact, he is prepared to maintain that the reason why more of the graduates of the three colleges have not followed technical careers is simply due to lack of development or over-production of engineers, whichever way one cares to face the problem. It is manifestly absurd to expect any country to absorb yearly some one to two hundred engineers and experts on a total track mileage of from four to five thousand miles with all the postal, telegraph and navigation services thrown in. It is one thing for the minister of communications to promise employment, and another to find it, unless he is prepared to create sinecures. The real answer to such statements is simply this, that at the present time, old students of the Tangshan College, with four years' courses and the associateship of the college behind them and a further experience of two or three years on engineering works abroad, are looking for jobs. Statistics showing exactly the number of students who have kept to technical work and have found employment in the board of communications would make illuminating reading.

"As regards the lack of practical training, in theory, at least, the way is simple. A student attends technical courses in order to learn certain elementary principles so essential in the application of scientific knowledge to engineering problems. A knowledge of the processes and materials used can only be obtained in, or upon, engineering works, and it is to the shop he should go if he wishes to obtain such knowledge. Unfortunately, it is difficult to get students to see the value of such training. Although it is unwise to dogmatise too freely, it is safe to say that the old *quasi-caste* distinction (not hereditary) of men into four classes—(1) Shih, the scholar; (2) Nung, the farmer; (3) Kung, the artisan, and (4) Shang, the dealer—is not wholly eradicated, and in China proper, at all events, it is almost impossible to get the scholar to play the part of an artisan, even for relatively short periods. The writer has seen the experiment tried with six fourth-year students in one of the largest railway works in China. In the first place, the scheme was sanctioned only after repeated representations had been made to the officials of the board of communications, and, in the second place, the students were lazy, objected to the time limits and general restraint imposed, and generally wasted their opportunities.

"It will be many years before technical education in China can be run on European lines. The apprentice or pupil at home takes his shop training as a matter of course, but in China the reverse holds, and the Chiao Tung University will fail, as its constituent colleges have failed, until such time as it refuses to grant engineering degrees and subsequent employment on purely theoretical training. Not 10 per cent. of the students who have graduated in Chinese colleges know the difference between a smooth cut and a bastard file, and men with less practical experience than that claimed by a third-year apprentice in England are given appointments as works managers. It is not for the really qualified man to grumble at this state of affairs. He is part of a system that encourages "Friend Pidgin," and that makes political feeling more important than engineering qualifications.

"There is a touch of irony in the situation as it exists to-day, and one wonders whether in all the welter of proposals, counter-proposals and paper reforms, the board of communications has realized its own shortcomings. In the writer's personal experience this same board has brought technical education to the point of ridicule by sending up "ploughed" students for three re-examinations in as many weeks, when such action could only be interpreted as an official order to pass these students.

"If the administrative authorities and the Chiao Tung Pu wish to co-operate for the good of students who, according to the claims of one Chinese writer, have the potentiality of developing into the best technical men, and really desire to give them a training suitable to the needs of their country, they must do something more than introduce paper reforms. They must slow up the process of turning out fully qualified technical men by making a three years' course in, or upon, engineering works an integral part of the curriculum. It is, perhaps, needless to emphasize the fact that there are many good places under the control of the board where such training could be obtained. In several, the student might eventually come to realize that many of his difficulties were due to the fact that his predecessors lacked the practical knowledge he was trying to acquire. Also, in time, he might realize that getting one's hands soiled was no disgrace, and that a country professing to strive for commercial prosperity must be prepared to eliminate those ideas of exclusiveness which hamper real progress."



# A Superfluous State Department

## Some Thoughts on American Policy in China

By Geo. Bronson Rea

**T**HE resolutions of foreign chambers of commerce in China make interesting and instructive reading and when confined to purely trade matters are extremely helpful to their governments and newspapers in advocating and supporting measures for the protection and advancement of national interests.

Unfortunately, however, there seems to be a tendency on the part of such organizations to depart from time-honored precedents and agitate delicate international questions to the point where their activities instead of being welcomed become a serious handicap to their governments in seeking and applying satisfactory and peaceful remedies. Only a few months ago, a set of resolutions were passed by a sub-committee of the American chamber of commerce, which, if acted upon by the American government, would have aroused intense anti-American sentiment throughout China and completely destroyed national prestige and the good-will that has taken years to build up.

The associated American chambers of commerce of China have now passed another set of resolutions for the guidance of their government in dealing with the many complex and perplexing problems arising out of the disturbed internal conditions prevailing in this country. On the whole they are sane, sensible and by far the most conservative coming from a body which to date has distinguished itself by its unreasonable attitude towards Far Eastern problems.

The resolutions fully covered the many needs of the American commercial community and with the exception of those dealing with political matters should have the full endorsement of everybody interested in the maintenance of national prestige and trade in China.

From the viewpoint of the American trader who sees his treaty rights flouted, his properties damaged or destroyed, his claims for reparations ignored, his bills for materials dishonored, in addition to being called upon to pay exorbitant and illegal taxes for the privilege of conducting business outside the treaty ports, the resolutions are far too conservative. On the other hand, when perused by Chinese and considered in connection with the previous set of resolutions, they will conclude that Americans are attempting to coerce their government to take more severe and aggressive action than did Japan in the 21 demands of 1915. Americans who read these resolutions will gather the impression that their government has been negligent in adequately protecting the lives and properties of its citizens and will strengthen their belief that a set campaign has been initiated to force the United States into some sort of intervention in the affairs of China that can lead only to most deplorable consequences.

We are not always in agreement with the policy of the American government in China believing that in many instances its attitude is influenced largely by our philanthropic, educational and religious interests and in the past by mischief-makers and embryo experts who knew only one side of the questions at issue, but we realize also that our officials have done all within their power and gone as far as public opinion will permit to protect national trade interests in this country. Any suggestion that the American government has been backward in co-operating with other powers to protect the lives and properties of foreigners in China will be resented in high official circles in Washington especially when such suggestions reach the stage of open accusation charging the minister at Peking with neglect of duty.

As a matter of fact, the American government has not only been most active in finding a suitable solution for the Chinese problem but has actually taken the lead in efforts to seek a feasible and practical method to restore stability. The difficulty of applying any constructive remedy is due not so much to the unwillingness of America or any other power to co-operate, but to the generally chaotic condition of China herself and the danger of uselessly arousing the latent anti-foreign sentiment throughout the country. Consideration for these conditions led the United States to reject a few months ago the suggestion of a great naval demonstration off the coast of China mentioned by another power as one of the means which might prove efficacious in bringing China to her senses.

The proposal was opposed by the American government on the ground that there is no channel to Tientsin for heavy warships and that ships lying outside the Taku bar would not be visible from Tientsin and could have no possible effect upon the *tuchuns*, who, safe in the interior, would laugh at a naval demonstration. The same argument holds good in other ports of China, where a show of naval force would have little, if any, effect.

To complicate the international situation, irresponsible elements such as the students, professional politicians and agitators, morally supported and encouraged by certain foreigners and defended by American publications, launched a deliberate campaign to renew the Japanese boycott, a campaign which at any time might have embroiled China with a power which has given convincing proofs of its sincerity and friendly disposition by the settlement of the Shantung question and adherence to the terms of the Washington treaties. The Japanese boycott might easily have led to developments which would have so complicated the international political situation that other powers could have done nothing to save China from the consequences of her folly. The sudden reinforcement of American troops in China and



HON. CHARLES SUMNER LOBINGER

Justice of the United States Supreme Court for China

A jurist of exceptional ability and probity, worthy of promotion to a higher court. His friends in China are conducting a vigorous campaign for his reappointment



an increase of naval strength in Asiatic waters at such a time might well have created the suspicion in Japan that we stood ready to defend China and uphold her demand for the cancellation of the treaty extending the Kwantung lease to 99 years.

Conditions have not materially changed and when Americans now call upon their government to increase its military forces in China to the full strength allowed by the treaties and augment the Asiatic fleet and Yangtze patrol squadron, the inference is that they are expected to compel adherence to the treaties by either a show of force or by actual armed intervention. This brings us back to the resolutions of a few months ago whose application would compel the United States to take the lead in a task wholly repugnant to public opinion at home, with the added certainty of arousing the resentment and hostility of the Chinese people. The recommendation to strengthen our military forces could only result in reinforcing the regiment at Tientsin by an additional 500 men, whose activities under the treaties are confined to keeping open the railway from Peking to the sea in the event of internal warfare in that region. The presence of an additional 500 men at Tientsin could have no moral effect on the *tuchuns* in the interior nor could they be employed for any purpose other than protecting the railway without violating the integrity of China and vitiating the Washington treaties. It is difficult to understand how the strengthening of this regiment could have any effect on present conditions or protect foreign lives and properties outside the American patrolled section of the Peking-Mukden railway zone.

There is considerable justification, however, in asking for additional craft for the present antiquated Yangtze patrol, all of which should have been scrapped ages ago. These boats should be built in Hongkong or Shanghai and placed in commission without delay. Here we are well within the treaties and until the Chinese determine to settle down and call a halt to internal squabbling and provide guarantees against piracy and interference with foreign navigation, they must expect to have their sovereignty further impaired by the presence of foreign war-ships on their inland waterways. The increase of the main Asiatic fleet entailing as it does extraordinary expenditures for the enlargement of the Manila naval base, may well be in contravention to the terms of the naval treaty. With Japan's power crippled for another generation, the present is no time to advocate any considerable increase in the American naval forces in Asiatic waters, and as pointed out, any such show of strength would fail to impress the Chinese warlords who dominate the interior. Increase of the army or the fleet would be justified only in the event of actual armed intervention for the protection of foreign lives and properties, and it is safe to say that American public opinion would never sanction such a step unless the menace reaches that point where international action becomes absolutely imperative. The Yangtze patrol is another matter and the chambers are fully justified in asking for this additional protection to their shipping.

Americans who shout the loudest for intervention and the strengthening of our armed forces in China are the same people who only a few years back loudly condemned Japan for applying similar measures for the protection of her subjects in Manchuria and elsewhere. They were foremost in denouncing the presence of a Japanese garrison at Hankow and tore their hair and yelled for war when Japan's position in Shantung was upheld at Paris. This element was fully informed that during the progress of the world war the allied ministers at Peking on two occasions requested Japan to send troops to protect foreign lives and properties in the north and as soon as the danger was past, they roused the Chinese against Japan, called upon the world to bear witness to her unwarranted aggressions and in general created an atmosphere that was only clarified by the Washington conference. Japan was ostracised, her prestige undermined and her trade killed by boycotts, simply because she attempted single-handed to protect and advance her vital interests in China. Yet with this lesson before them, we find the chambers advocating at this late date, the application of measures they so loudly condemned and were even willing to have their countrymen go to war over a few years ago. Are these Americans now willing to assume a leadership that will carry with it the same consequences? For just so sure as their recommendations are carried out and America takes the lead in straightening out the tangled affairs of China against the will of the Chinese people, just so sure will other nationals turn on us in the same manner as they turned on Japan, just so sure will they arouse the Chinese against us and advocate reprisals and boycotts.

Is it any wonder that sober-minded Americans cannot always endorse resolutions passed by their countrymen, when such inconsistencies and fatal remedies are proposed passed and broadcasted through the medium of the press?

Another delicate question which received attention at the meeting of the chambers was the bill now under consideration by congress which amongst other things contains clauses providing for placing the U. S. court for China entirely under the supervision of the department of justice, instead of, as at present, the state department; extending the power of the U. S. commissioner and making him an assistant judge, and providing for a modified jury trial. The bill received the approval of the chambers. This raises certain points which seem to have been treated rather lightly in so far as general public opinion is concerned. For the past three years the American community in China has been divided into two camps over the question of the American court, while the past six months has provided ample evidence of a determined campaign to have the judge reappointed on the expiration of his term. The present incumbent, Judge Charles Summer Lobinger, is a jurist of exceptional ability and probity, who has proved his worth in the Philippines and in his present position. He is worthy of official recognition and promotion to a place on the bench where he will have a wider opportunity to display and exercise his profound knowledge of the law. Rightly or wrongly, the judge aroused considerable criticism over his decisions to an extent where many lawyers seemed to feel that they were not receiving equitable treatment, all of which led to an investigation in which the judge was exonerated by the department of justice and received a personal note of congratulation from the president. The aftermath of this incident, however, has been unfortunate, inasmuch as the friends of the judge have engaged in open electioneering for his reappointment, employing methods which pass in ward politics at home but wholly undignified when applied for the appointment of a judge to the supreme bench.

We cannot subscribe to the questionable tactics to discredit the judge indulged in by his opponents nor can we endorse the activities of his friends in electioneering at every possible opportunity for his reappointment. The record of the judge is before the authorities at Washington. It is an honorable record and entitles him to promotion. The judge has served nearly ten years in China, and the time has now arrived for the application of a jury system to decide important cases which come before his court. Judge Lobinger is on record as being opposed to the jury system in the court over which he presides. There may be excellent legal reasons why the present system should be perpetuated, reasons which we are not familiar with, but whatever these reasons are, they are not strong enough to convince us that justice can be dispensed at all times with equity by any individual, no matter how profound his knowledge of the law or how impartial or unprejudiced his views. The right to trial by jury is fundamental, and to surrender this precious privilege only serves to strengthen the hands of reactionaries and invite charges of favoritism or prejudice against the dispenser of justice. Here, we believe the judge has erred, and invited suspicions which grew until they assumed the character of direct charges, which, happily, proved unfounded. The jury system was evolved only after centuries of sacrifices and struggles against absolutism for the protection of the accused; it is also the one safeguard for the reputation of the judge. The inalienable rights of the American citizen to a trial by a jury of his peers should be extended to the United States Supreme Court for China, and if we have any cause for differing with Judge Lobinger, it is solely because we believe that his own position will be strengthened and further criticism against the court forestalled by the adoption of a basic principle which guarantees to bench and bar a decision precluding any suspicion of favoritism or prejudice. The recommendation of the American chamber of commerce for the appointment of assessors to sit with the judge does not go far enough. Americans in China will never be satisfied until a full or at least a partial jury is empanelled to render a verdict on important cases.

The transfer of the court to the jurisdiction of the department of justice may also be based on sufficiently good reasons to warrant such a revolution in the conduct of our foreign relations. We can readily understand and support the argument that the dispensation of justice under our government should come under the jurisdiction of the department of justice, on the other hand, we fail to see how this can be extended to China without complicating the already difficult problem involved in living up to the terms of the Washing-



ton and other treaties between America and this country. The most important question now before the Chinese is the abolition of extra-territoriality, and although action on this may be deferred for some years, when internal conditions are again stabilized, the Chinese will once more concentrate their diplomacy and propaganda upon the realization of this aspiration. The establishment of an extra-territorial court outside the jurisdiction of the state department can only tend to hamper the latter's liberty of diplomatic action when called upon to face this issue.

So long as the state department is charged with the conduct of foreign relations under the direction of the president, it would be most inappropriate to have officials of the extraterritorial court in China under the supervision of some other department of the government. To receive attention, all correspondence with Chinese officials must pass through the hands of the consular or diplomatic officials, and unless the utmost care is used in wording such communications, it would not be difficult to precipitate a situation that would nullify the work of the duly accredited officials of the state department and undermine their usefulness. A case in point arose some months ago when the U.S. district attorney sent a rather peremptory communication to the *tuchun* of Chekiang concerning the arrest of an American in Chinese territory charged with arms smuggling. This encroachment of the court on the duties of the consular service raised a tempest in a tea pot, the end of which is still to be heard from.

The United States supreme court for China was established for the express purpose of carrying out the provisions of our treaties conferring upon the American government jurisdiction over its citizens in this country. In the absence of the treaties the American government would be without authority to establish American courts in China. The enforcement of the treaties is vested in the state department and the officers of the courts should be under the direct control of the department which has to do with the enforcement of treaties. The United States court for China was also created to relieve the consular officials of some of the heavy work connected with the increasing number of disputes arising in this country and of taking over the more important cases coming before the minister and consuls, the general purpose being to carry out the treaty provisions. After the creation of the court the consuls retained jurisdiction in certain classes of cases. Under the act creating the court it can only function in buildings belonging to the various consulates, and it was intended that the court would constitute a part of the judicial machinery of the American government in China under the department having charge of carrying out the treaty provisions.

The court cannot function without the cordial co-operation of the consular service. It is frequently necessary that officials of the court, especially the district attorney, should assist the consuls in court matters, and that degree of co-operation which is absolutely essential in order to maintain national dignity in China can only be obtained between these two classes of officials when they are accountable to one department. If one is responsible to the state department and the other to another department of the government, friction and divided authority is bound to develop. The fact that the court functions in a foreign country and is consequently intimately connected with our foreign relations should be a sufficient reason why its officials should be solely answerable to the department of state. If we are seeking to complicate our relations with China by a further extension of American governmental powers and jurisdiction over its citizens in this country, all we have to do is to permit the various departments of our government to send their officials here to operate independently of the state department. Every department of the American government with the exception of the interior is now operating in China either in co-operation with or independently of the department having charge of our foreign relations. In fact, as we had occasion to point out some months ago, Americans in China have all the advantages of their own government except the right to exercise the suffrage and to trial by jury. The operation of these various departments in China under treaties which concede to our government extra-territorial rights over its citizens, can only tend to the growth of a system that will be difficult to uproot when the time arrives for a serious consideration of China's claims for the abolition of extra-territoriality. There may be good reasons why the department of justice should extend its jurisdiction to China by taking over control of the court and making it directly answerable to the attorney general; there are equally good reasons, why the commerce

department should function in China independent of the state department; we have a separate army command answerable to the war department; the commander-in-chief of the Asiatic fleet is directly under the orders of the navy department; there is no good reason why the treasury department should not open an office for the collection of income and other taxes; the department of labor should have its own office to inspect and pass upon Chinese taking passage to the United States; the marine health service and shipping board representatives are on the ground; so there is every reason why the department of justice should also establish itself here independently of the state department. There is one solution to all this that evidently escaped the attention of the American chambers of commerce; that is, the complete withdrawal of the state department officials from China altogether. If all other departments of the American government are to function in China under the treaties and have jurisdiction over American citizens, the consular service becomes superfluous and should be eliminated as rapidly as possible. The minister at Peking might be retained as a messenger boy for the secretary of state or he might even be elected by the American community in China and receive instructions direct from his constituents. Once we bring in all other government departments to operate independently of the state department there is no valid reason why the latter, shorn of all power, should continue to function.

This being the situation, it causes no surprise to read that the American chambers have resolved to ignore prescribed methods in communicating with its government through the medium of consulate and legation by creating a special office in Washington through which congress and the departments will be approached direct on all matters connected with American interests in China. The chambers believe that more suitable action may be obtained in matters pertaining to China and the *Far East*, affecting American business and interests generally, if they were directly represented at the national capital, and it was resolved that arrangements be made at once to appoint such a representative who will be empowered to give publicity to all matters which may be referred to him from time to time, to enlist the aid of the chamber of commerce of the United States, government officials and departments and commercial and other organizations interested in the various subjects referred to him for attention. It is easy enough, therefore, to connect this resolution with the one which follows:

"Owing to the fact that foreign trade occupies such a small portion of the interest or activities of the American people generally, it is always difficult to induce the American government to adopt constructive and continuing policies in foreign affairs and especially in respect to American interests in this part of the world. The lack of familiarity on the part of many of the officials at Washington in respect to the protection of the lives and property of its own citizens not to mention the larger diplomatic and strategic interests of America in the Far East as made it necessary for American citizens both individually and through their organizations to frequently conduct publicity campaigns in the United States. Such publicity campaigns in the past, although largely unorganized, have nevertheless been of considerable benefit in concentrating the attention of the American people and through them of the government upon particular problems affecting the interests of Americans in this part of the world.

"In view of the serious situation now existing in China which constitute a menace to the lives and interests of American citizens residing in the Chinese republic, it is recommended that the associated American chambers of commerce of China give this subject special attention and that a special committee be appointed to work out in co-operation with other American organizations, a definite publicity campaign calculated to bring to the attention of the American people, members of congress and other officials of our government the necessity of a definite policy in respect to the present situation of China."

It is difficult for a publicity expert to understand just what subjects are so important as to call for the appointment of a super-representative and his maintenance at Washington at a large salary and entertainment expenses without which he cannot function with success. The American chambers of commerce can have all the free publicity required for legitimate propaganda from representatives of the American press now stationed in China. The state department daily gives out all important news that comes from its officials in China; the commerce department is on the job at all times to sell China to the American manufacturer and



merchant. Once a year at least, the commercial attaché at Peking is called home and instructed to swing around the circle and tell the people about trade opportunities in China. Every publicity dodge has been tried to interest Americans in this country, every argument that could excite interest has been advanced, yet Americans have not responded. The truth is that the American people are fed up with publicity about China. Our merchants responded in 1919 to the campaign of the China booster and swarmed into the field, only to get stung. It will be difficult to make them bite twice. They recall previous publicity campaigns directed from China which nearly precipitated war with Japan; they recall that nearly every publicity campaign sponsored by Americans in China has resulted in disaster. They recall that it was this element which opposed dissemination of the truth about China previous to the Washington conference, and that present conditions are largely traceable to the hullabaloo raised by these same Americans demanding full recognition of China's sovereignty. They will recall that the same element which so strenuously opposed intervention by other powers is now clamoring for America to go it alone, to increase our military and naval establishments and unaided assume responsibilities which would overturn our traditions and diplomacy and bring down on our heads the odium of every Asiatic people.

We have every sympathy with any move that will bring greater protection to the lives and properties of foreigners in China and with every legitimate proposition for the advance of national trade interests, but when a few men representing American business interests assert that Americans have to be educated to the larger diplomatic and strategic interests of their country in the *Far East*, and that such education is to be carried on through publicity campaigns directed by the representative of the chamber, we are forced to enter an emphatic note of warning. Much of the misunderstanding surrounding Chinese and Far Eastern problems is traceable to the misdirected activities of commercial organizations in going outside their legitimate sphere to meddle in international politics by sponsoring publicity campaigns directed by half-baked experts who used these organizations to further their own ends. The above resolution is evidence that the American people are to be once more aroused by a campaign obviously designed to coerce the state department and bring pressure to bear in other quarters to take action in China along lines repugnant to our conceptions of international ethics and opposed to our traditions. It is safe to affirm that the larger diplomatic interests of the United States in the Far East are fully understood by the very capable and experienced diplomats who direct our foreign relations and it is equally certain that every strategical possibility that might be discovered by the director-general of the proposed publicity campaign has been studied, pigeon-holed and forgotten by the war and naval colleges many years ago. If Americans in China now feel that they must educate the people and government of their country on these purely technical and highly specialized subjects why not go a step further and resolve that the super-expert representing the Associated American chambers of commerce of China be appointed *ex-officio* a member of the army and navy general staff and confidential adviser to the president and secretary of state on Far Eastern problems. Why embarrass the government by merely sending him to Washington to open a headquarters to educate the people through the newspapers?

Just how far a publicity campaign as proposed by the American chambers in China will adhere strictly to its own sphere, is open to much speculation. Having in mind past incursions into the publicity field by the same element which still largely directs American activities in this country, it is highly probable that its experts who seem to have learned nothing or forgotten nothing in the past few years, will attempt once more to turn public opinion at home against Japan. There can be no other interpretation to the phrase that Americans have to be educated to the larger diplomatic and strategic interests of their country in China and the Far East. Why the Far East? Why should Americans in China meddle with the affairs of other countries and arrogate to themselves the sole right to interpret these interests? Why should not American business-men in Japan ignore their ambassador and consuls and appoint a resident high-commissioner and publicity expert to reside in Washington and educate the government and people to their one-sided conception of policies that benefit their trade? Why should not American chambers of commerce in all other foreign countries, kick over the traces and follow the lead of Shanghai and

declare their independence of the state department and raise general hell in the newspapers about the indifference of the government to their claims for special treatment? We would then have a real circus performing all the time at the national capital. In this particular case, it is almost a certainty that if the resolution of Americans in China is carried into practice, Americans in Japan will be compelled in self-protection to appoint a similar delegate to offset the pernicious anti-Japanese activities of their China compatriots.

There are certain fundamental features connected with publicity campaign to educate the American people on strategic and diplomatic matters that seem to have been ignored. It is not difficult to carry on such a propaganda in the United States when the object to be attained has the approval of the heads of the state and other government departments. It is hopeless on the other hand to make headway in such matters against the opposition of the government, and when a campaign is launched, which on its face suggests a slight to the state department or conceals an attempt to coerce it into modifying its foreign policy to suit the ideas of a minority, a word from the secretary to the Washington correspondents will close the columns of every reputable newspaper in the country to such publicity. It is hardly probable under existing political conditions in the United States with the results of the Washington conference still fresh in the minds of the people, that any progress can be made in reversing the basic principles then promulgated. Americans in China clamored long and loud for the concessions that guaranteed China's place amongst the nations. Their arguments were accepted by the government and people at home and incorporated into the Washington treaties. The administration at this early date cannot go before the country and confess that it was buncoed without losing political prestige and present the democrats with ammunition to use against them in the coming presidential campaign. The same people who urged these concessions to China now ask the government to reverse its policy. American commercial organizations in China called for the hand that was dealt them by the administration. If they now go before the country in a publicity campaign denouncing the policy so strenuously advocated two years ago, we see no good reason why the republican and independent members of the associated American chambers of commerce of China should be called upon to subscribe funds for defeating their own party. The expenses should very properly be paid out of the campaign fund of the democratic national committee, who, we are assured, would gladly contribute any sum to nullify or minimize the political prestige gained by the administration as a result of the Washington conference.

The political pot at home is beginning to boil. The progressives and democrats are looking for any good argument that will put a crimp in the administration. The resolutions and program of the associated American chambers of commerce of China present them with the heavy guns for a frontal attack, and the super-representative and director general of the campaign will be received with open arms when he arrives in Washington. Let the democrats pay the bill!

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## Probst, Hanbury's Come-Back

IT is extremely gratifying to learn that after the serious losses due to the slump of 1920, the old Kung Ping Hong with eighty years of experience behind it has weathered the storm and is once more well on the road to prosperity. Some months ago we had occasion to refer editorially to the misfortunes which befell this firm and now with the latest report for 1922 before us, we are glad to correct any erroneous impressions which may have been created by our comments on the business situation which necessarily included some mention of their troubles. The last report shows that the old concern is still finding plenty of scope for its activities and has made considerable recovery from the ill-fortune that followed its conversion into a public company. The flotation of the company, says the *Financial Times*, took place in January, 1920, a period now associated with evil omen. It was a modest proposition, brought out under excellent auspices. The public was invited to subscribe for £67,000 in eight per cent. preference shares and £143,000 in ordinary shares, the vendors receiving £33,000 of the former and £67,000 of the latter in part satisfaction of the purchase



price. The profits of the business were shown to have been subject to sharp variation. A passage in the prospectus to which subsequent events have given an ironic turn stated that the stock-in-trade and goods under contract for delivery had been "acquired on exceptionally favorable terms, and very satisfactory profits, for this company are anticipated from their realization."

For 1920, the first year of working in the new form, the preference dividend was paid, but before the accounts for that year could be submitted came the intimation that the preference dividend due on 30th June, 1921, could not be met. The 1920 accounts were produced in August, and showed trading profits and other receipts totalling £242,800, subject to £74,900 of working expenses. The balance of £167,800 was turned into a debit of £134,000 by the necessity for writing £301,800 off stocks to bring them to current market values. Payment of the preference dividend raised the debit to £140,600. The next year added £166,000 to this figure, and in presenting the 1921 accounts the directors frankly said that the paid-up capital of £310,000 had been "practically all lost," mainly because the inland revenue refused, on account of the change of ownership of the business, to make any refund of £217,400 of excess profits duty. The 1921 accounts were not issued until March this year, by which time an approximate idea of the 1922 results had been obtained. These indicated a moderate profit, and the recuperative power of the business having been proved, the directors foreshadowed a scheme of reconstruction, involving the provision of some £50,000 of new working capital.

In the report for 1922 now presented the directors announce that the scheme for writing down the capital is in train, that of the £52,500 in preferred ordinary shares they propose to create to furnish working capital £15,000 has been promised by directors and their friends in England and £22,500 by directors and shareholders in Shanghai, and that the remaining £15,000 is expected to be subscribed by other shareholders or connections in Great Britain. The year's trading profit was £63,000, after £4,100 had been written off stocks, and it may be hoped that the latter is the last word in a dismal chapter. On the sale of part of the property in Shanghai a profit of £33,700 was made, but £14,000 was involved in winding up what the report describes as "the unfortunate machinery department." Allowing for these items, the actual trading profit is put at £30,600, which may be deemed quite good in the circumstances ruling in China, and as warranting the belief that, after two years of unprecedented strain, this old business (it has nearly 80 years of history behind it) will, with the aid of new capital, resume the thread of its former fortunes.

From all sources 1922 provided £50,300 with which to diminish the profit and loss debit, thus curtailed to £256,300. This points to the obliteration of the greater part of the paid-up capital. In March this year the directors estimated that, if 1922 produced a net trading profit of £24,000 the company would be left with intact capital of £48,500, exclusive of goodwill, which does not figure in the accounts, though the directors put a considerable value on it. The balance-sheet of 31st December last showed decreases of £59,400 under bank acceptances and loan secured on shipments, of £101,700 under bills payable and £16,200 under overdrafts in Shanghai, while sundry creditors stood for £11,700 more. Under current assets a decrease of £159,200 to £657,100 appears, the decline in stocks being £65,800 to £298,900, in joint shipments of merchandise £28,400 to £97,400, in advances on shipments £15,300 to £12,100, in sundry debtors £7,100 to £84,800, and in cash £31,000 to £27,500. There is evidence in these figures that the company was still finding plenty of scope for activity.

## Papermaking in China

### Description of a Hand-made Process

AN interesting review of papermaking in China now and in ancient days was given recently before a meeting of paper men at Watertown, N.Y., by Mr. Perry D. Taylor, who for 15 years has been engaged installing paper machinery in the Far Eastern republic.

That the business of papermaking should attract the Chinese is not only most natural, but there is a growing demand for paper to meet the needs of the modern education the Chinese students are bringing to China from many foreign countries. The Chinese were

the inventors of making paper from artificial pulp. They made paper from pulp as early as the beginning of the Christian era. Besides inventing the article the Chinese excelled in the quality of the paper they produced. India proof engravings, which were so highly esteemed in the days when hand engravings flourished were obtained by pasting a piece of India paper on the face of the home-made printing surface. This particular variety of the article could not be produced by the papermakers in India, but it came from Canton, China, in the form of wrapping paper on Chinese silks.

The Japanese learned the art of papermaking from the Chinese but soon excelled them in many qualities, while the West went far ahead of either by the introduction of machinery to take the place of the simple hand appliances. But to this day the hand-made papers are the best, and they are produced by the old Chinese method of now over 2,000 years ago.

### Family Concerns

Owing to the fact that the Chinese seldom form companies for business purposes outside of their immediate families they have to learn of our rule that in union there is strength in the business world as well as in matters of state. To-day there are thousands of family paper mills in China employing only the members of their immediate families. Mr. Taylor lately made a business trip into the interior of Kiangai province, where there are over 300 such mills scattered about the bamboo section of the province.

Bamboo is made into pulp by first crushing the pole—they do not chip or cut—after which alternate layers of crushed bamboo and layers of unslaked pulverised lime are put into a trench in the ground, then the trench is flooded. Any small boy who has watched at a mortar bed can form an idea of the heat and boiling therein. The mass is allowed to stand for three or four weeks before being sorted. At this time the white pulp, the cream pulp and the wrapping paper pulp are placed in separate bins while the uncooked stalks are returned to the next cook.

The beating or reducing of the fibres is accomplished in large mortars carved of solid rock and men with pestles or stones and a wooden handle refine the stock. The natives also use a small koller-gang arrangement with water buffalo pulling on the outside to revolve the stones in the rock trench. The pulp is screened through bamboo woven screens by hand.

### The Process

Making sheets of paper is accomplished in the usual moulds on woven bamboo cloth and the sheets always have imprinted markings like dandy roll marks. In making coarser paper the operator dips his hand mould into the vat and scoops up an unmeasured amount, but in nicer qualities the mould is rested on cleats with the bottom of the vat submerged and a dipper is used to dip up a measured amount of milky pulp. The operator then keeps the mould bottom below the water until, by violent shaking, the sheet is well formed. The mould is then lifted out and set on a table and a pad with handle is pressed on the inside of the mould and the sheet sticks to the pad when lifted out. The pad is then pressed on to the pile of wet sheets and as it is lifted the sheet of paper remains on the pile. After an inch or less of sheets is accumulated a cloth is spread on the pile and more sheets placed on top. Later stone weights are put on the piles to remove more of the water.

The sheets are dried and calendered by sticking single sheets on to door-like panels of wood highly polished on one side. After a panel is full it is leaned outdoors facing the sun until dry and the side next to the panel is highly finished.

Very little sizing of paper is done in the native mills, as all the product is consumed in China, where printing on but one side and writing with brush is the custom.

China is greatly handicapped for the want of raw material for the modern paper mills already there, but no doubt crops of raw material will soon be raised to fill the need, or wood will be obtained from Manchuria or Siberia. At present the following raw materials are used in China: Bamboo, rice and wheat straw, lung sea grass, goo tree bark and mulberry twigs saved from the food of the silk worm. The first ground wood mill was started in China last June.

The most valuable paper stock Mr. Taylor ever used consisted of 80 tons of used paper money and new money thrown out of use at the time of the change from monarchy to republic.

There are now in China eight paper mills with modern machinery, 13 machines in all.

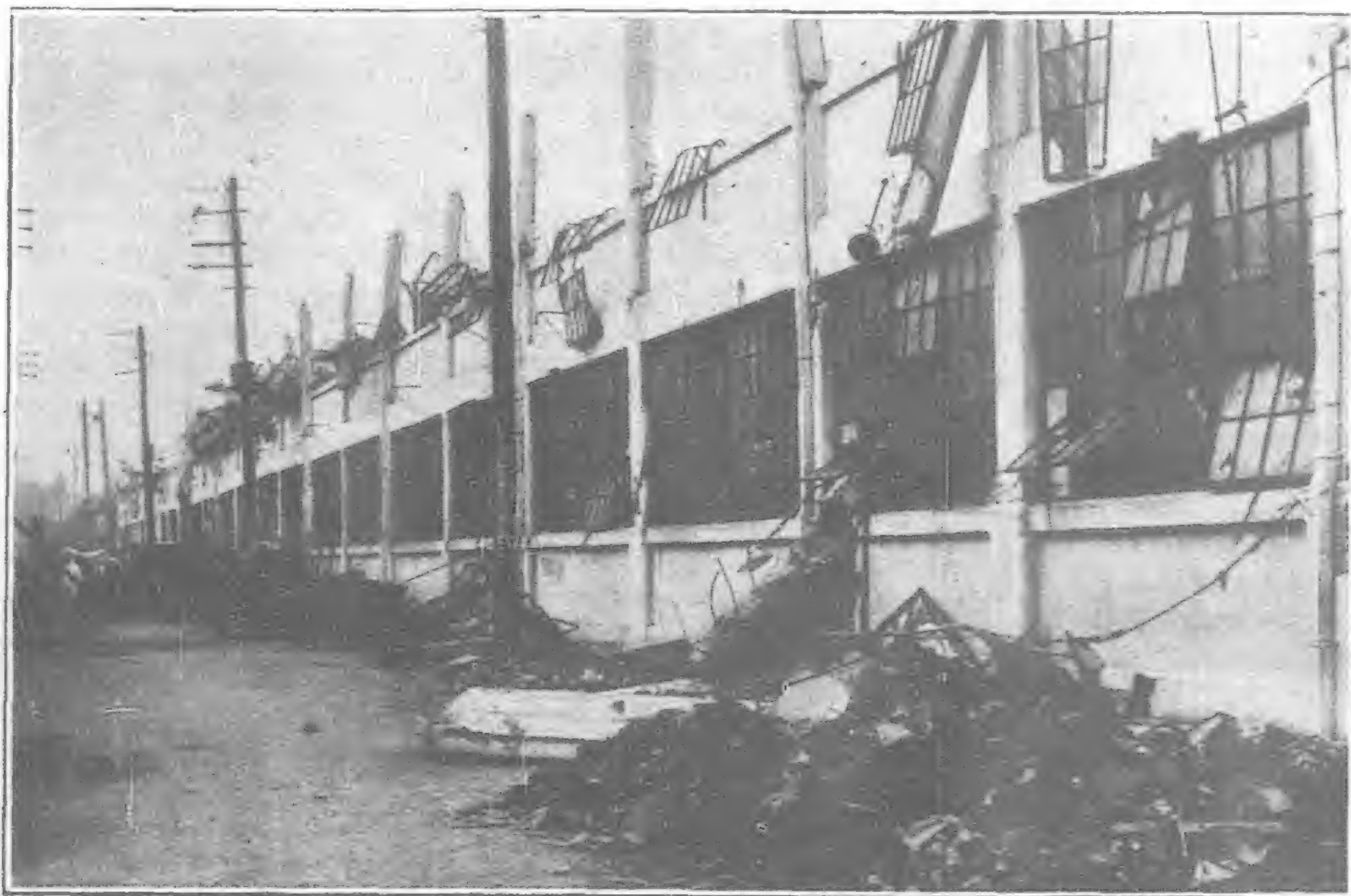


# Electric Reconstruction in the Tokyo-Yokohama District

**O**WING to the destruction of several of the foremost electrical equipment plants in the Tokyo region of Japan, a great proportion of the electrical supplies needed for replacing damaged installations will have to be imported from foreign countries. This is specially true of accessories and outside equipment. By far the most serious blow to the Japanese electrical industry was the destruction of the plant of the Shibaura Engineering Works, its

Besides these plants, a number of other small electrical factories in Tokyo and Yokohama were either demolished or consumed by fire. This throws the load of furnishing equipment for electrical reconstruction on the plants of the Osaka region, whose production capacity was only about forty per cent. of the plants in the Tokyo district. Aside from the Mitsubishi electrical plant at Nagoya, the Sumitomo Wire and Copper Works, the Okumura Electrical Works at Osaka, and the Hadachi Engineering Works, most of the manufacturing plants in the Kansai region are unimportant. Naturally, the Kansai manufacturers will reap the major benefits arising out of the necessity of rapidly replacing the requirements of the devastated areas. The Mitsubishi company in co-operation with the Kawakita Electrical Works of Osaka is preparing for an active sales campaign. However, even in normal times, electrical equipment has been imported from abroad to the extent of fifty million yen annually, and in the present crisis where time in delivery is the essential quality, many large orders are being placed in America and Europe.

The almost complete wiping out of the industrial life of Tokyo and Yokohama has resulted in an enormous surplus of power from the many hydro-electric plants supplying these districts and in the suspension of construction on new power houses. The demand for current in Tokyo and Yokohama before the disaster averaged 282,000 kilowatts, registering a steady increase of about fifteen per cent. annually. The Tokyo, Shinyetsu, Toshin and Hayakawa Electric companies had accordingly formulated their construction programs



forging shop alone being saved. Fortunately, work on the new plant outside of Tokyo had been commenced, but it will take at least a year to bring it to the producing stage. The next great loss was the Yokohama Wire and Cable Works of the Furukawa Company which produced over fifty per cent. of Japan's requirements. Both its Yokohama and Honjo plants are a total wreck. The fine new plant of the Nippon Electric Company specializing in the manufacture of telephone apparatus was demolished. The Tokyo Electric Company which supplied the larger part of the electric bulb demand, suffered not only serious damage to its plants but in the loss of a corps of specialists killed during the earthquake. The damage to the Oi works of this company was comparatively slight, only part of the brick side walls collapsing, with no damage to the machinery. The glass melting furnace and crucible collapsed but these have since been repaired, and as soon as gas is procurable will be in a position to resume work. The laboratory and research building of the great Kawasaki plant of this company collapsed causing the death of many workmen including the corps of experts. The Hatagaya works of the company were practically untouched by the quake and will resume operations at once.

The Meidensha, one of the largest manufacturers of dynamos and motors, whose plant is located in Osaka-machi near Tokyo, escaped with only slight damage. This was largely confined to the large machine shop where several of the more important machines were thrown out of alignment by settling foundations. Its capacity for producing small type motors is practically unimpaired.

to increase the capacity of their plants by approximately 484,000 kilowatts, some of which were being carried out. The disaster, however, decreased the number of electric lights consumed by about 48 per cent. with a great decrease in the demand for power resulting from the destruction of factories.

The Daido Electric Power Company, for instance, calculated



These two illustrations show how the new reinforced concrete buildings of the Nippon Electric Company failed during the earthquake. The two upper floors collapsed on the first concrete floor.



to supply about 27,000 kilowatts to the Tokyo-Yokohama district from its new Momoyama power plant and in addition found it difficult to market its 282,000 kilowatts for power purposes in the district. This company expects to find a surplus of 80,000 kilowatts in its Tokyo-Yokohama market, and for the present will suspend its plans to increase its output confining itself to finishing the Momoyama and Yomihaki power plants. This company will divert its energies to finding a market for its in power in the Osaka and Nagoya districts, confident that its surplus will be readily taken up by the increased activity of and demand for



Yurakucho Transformer Station of the Tokyo Electric Light Company, after the fire

meters and measuring instruments affords another opportunity for foreign manufacturers to obtain a large share of the orders for replacement.

### Reconstruction Orders

Before the ashes of Tokyo were cold, plans were being prepared to replace the ruined substations of the Tokyo Electric Light Company with their mass of transformers, switchgear and voltage regulator equipment. A total of 25,000 distributing transformers had been burned

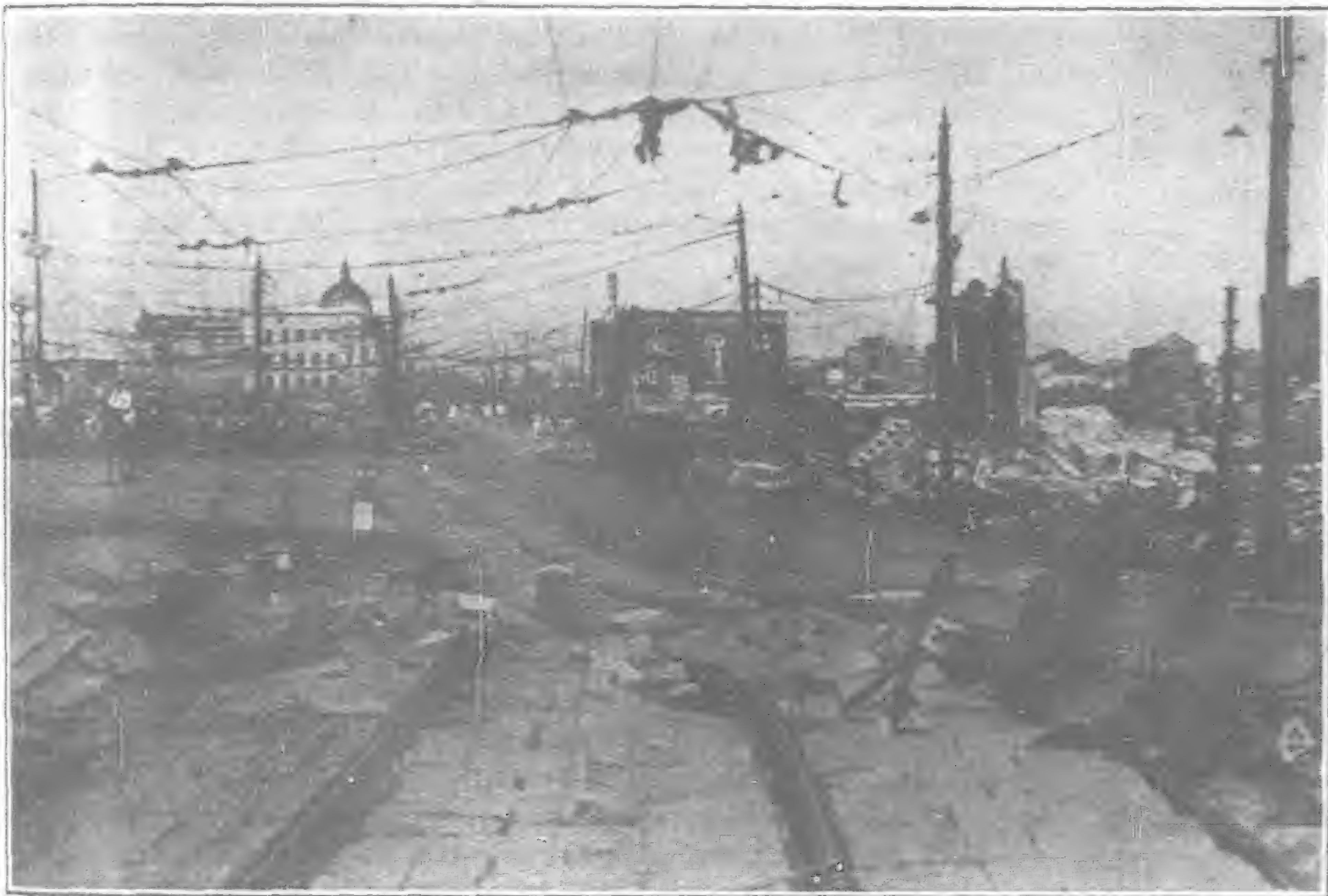
and a complete replacement was necessary.

The main office of the Tokyo Electric Light Company had disappeared, but temporary offices were established across the street from the Imperial Hotel, which became, temporarily, the centre of business activity in Tokyo. The office of the Westinghouse Electric International Company, with that of their agent, Takata & Company, had also been destroyed, but in a few days catalogues and price forms had been carried in on the backs of messengers from other offices, so that business has been going on as usual from September 5 in offices in the Imperial Hotel.

To supply the most immediate needs of Tokyo, the Westinghouse Company, were entrusted with various rush orders for quick shipment; among the more important are the following:

### 7,000-Kva, Type "S," Single Phase, 50 Cycle, 3,300 Volt Distributing Transformers for Pole Mounting

These transformers will be scattered throughout the burnt district of Tokyo, to step down the voltage for the 210 volt and 105 volt supply lines which will again enable the small factories as well as business houses and homes to enjoy the benefits of electric light and power. The transformers are of a new design, the cases and covers being of pressed steel,—making them light and easy to

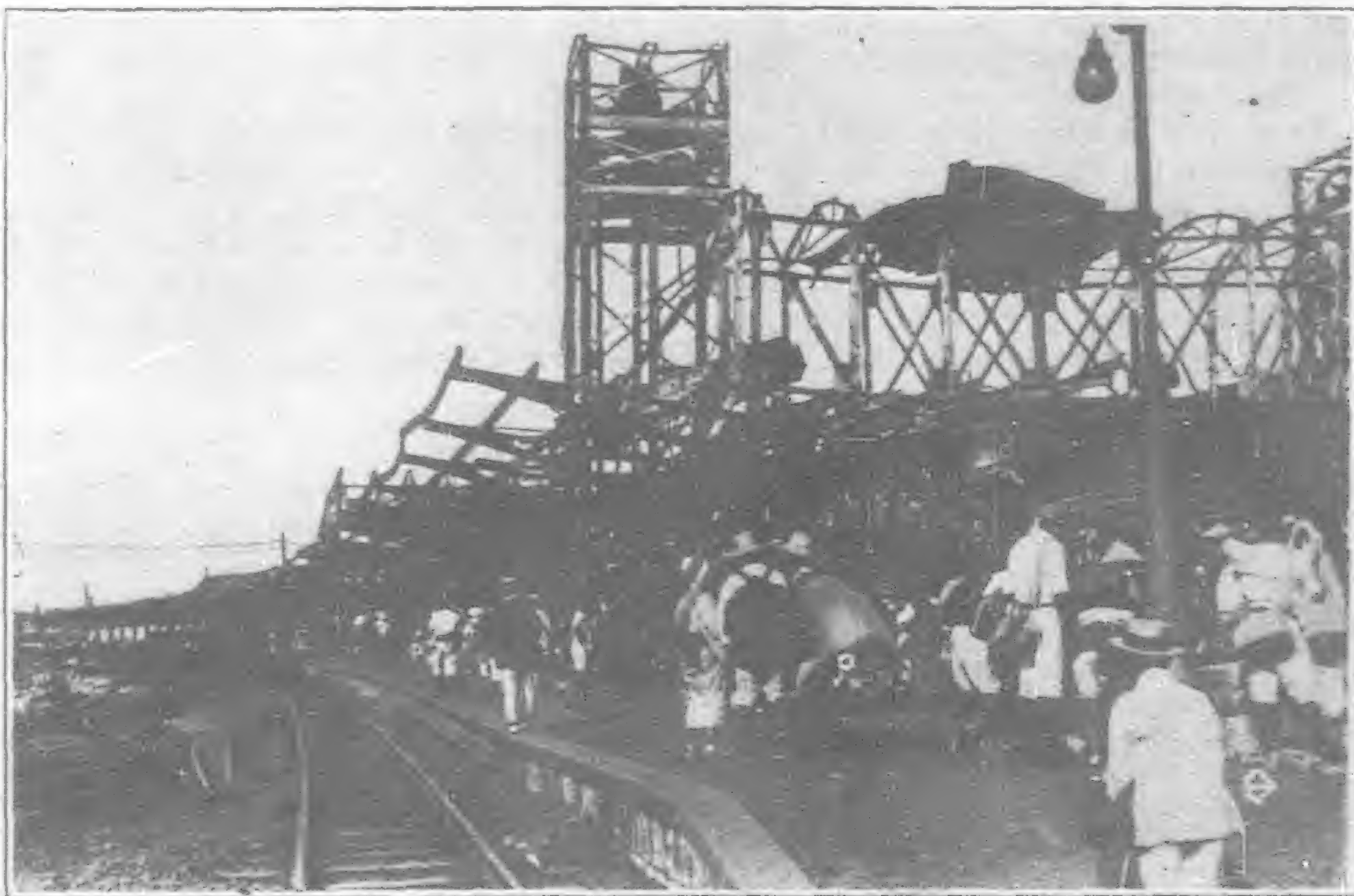


The havoc wrought by the Quake to the Tracks of the Yokohama Electric Tramway

more power on the part of industrial establishments in these centres.

The excessive tightness of the money market has forced some of the larger power enterprises to seek new capital for construction by issuing debentures at home and abroad, and unless this financial assistance is forthcoming, many promising and profitable plans will have to be suspended or abandoned.

The copper industry is experiencing a boom. Before the disaster the mills had been working on a schedule of limited production, but due to the destruction of the copper and wire works of the Tokyo-Yokohama districts, the Osaka and other Kanto mills are now working to full capacity and in some instances planning to increase production. Some idea of the extent of the damage which must be repaired is seen in the losses of the department of communications which totals Y.300,000,000, of which Y.250,000,000 will be necessary for telegraph and telephone repairs alone. The Tokyo municipal authorities report that 7,112 factories of various kinds and their equipment of 9,752 motors were destroyed by the earthquake and fire. The destruction of factories engaged in the production of



The Railway Station at Yokohama



install and being an insurance against breakage which is experienced with cast iron construction.

Work is being rushed on these transformers—a special department being devoted to their manufacture; and by shipping overland via Seattle they will be in Japan in a few months.

#### 224 Automatic Single Phase, Feeder Induction Regulators 60 Kilo Volt Amperes, 3,450 Volt Primary

These regulators are very essential in a district where light and power are drawn from the same distributing system, as they automatically keep the voltage constant at all loads.



The Works of the Tokyo Electric Company at Kawasaki, showing Research Building which collapsed during the Quake

The heart of the regulating system is a primary relay, or contact making volt meter which is very sensitive to fluctuation in voltage and which actuates a motor driven regulator at the least voltage variation.

This is the largest order for regulators ever placed for export, and it is a tribute to the designing engineers who have produced such an accurate and sensitive power regulator device for the largest cities in the United States. When it is recalled that a three (3%) per cent. reduction in the voltage on a system causes over ten 10% per cent. reduction in the light drawn from an electric bulb; and that a three (3%) per cent. increase in voltage would mean a short life for the bulb, the importance of accurate regulating equipment is apparent.

#### 215 Large Heavy Duty Oil Circuit Breakers for Controlling the Power Circuits in Various Sub-Stations

These circuit breakers are of the same design as those supplied in quantities during the last three years, to the largest power companies in Japan,—the Tokyo Electric Light Company, the Daido Electric Power Company and the Nippon Electric Company.

This order is, however, of particular importance, as the whole burnt district in Tokyo must depend upon these controlling devices for handling the electric power in the future.

These breakers have heavy steel individual tanks, and are especially designed so that they can be installed quickly on delivery. One hundred of the largest breakers are, in fact, equipped with the necessary supporting frame work so that with the connection of cables to their terminals they will be ready for service.

This is a great improvement over older types of construction, where it was necessary to construct expensive brickwork and concrete structures on which these breakers would have to be mounted before they could be used.

#### Heating and Cooking Apparatus to Absorb about 7,000 Kilowatts 10,000 H.P. of Electrical Energy

This order for heating and cooking appliances represents a new era in the electrical history of Tokyo. Until the catastrophe of September 1, the power lines of Tokyo were overloaded and it was with difficulty that current could be supplied for light and electric power, especially during periods of minimum rain fall. Provision had already been made to tap the 200,000 k.w. power system of Daido at their pivot plant at Momoyama, and eventually 100,000 k.w. would have been drawn from that district. However, with the greater part of industrial Tokyo wiped out there was a severe contraction in the power demanded so that power will be exported to the Osaka district, rather than drawn from that territory.

Plans had already been laid for developing the use of heating apparatus but the time for their application has now been advanced at least three years. These heating appliances will fit admirably at the present time as the many temporary office buildings and homes have not provided for any heating plant and much suffering will be avoided this winter by the general use of electric heating.

It is expected that these initial installations will be the forerunners of the general adoption of electric heating in Tokyo homes and offices so that in a year or two the Tokyo Electric Light Company will again be searching for ways and means of increasing their power supply. The rebuilding of factories with their large motor load will follow as a matter of course, and the Tokyo district will resume its schedule of doubling its power and light consumption every five years.

#### Kobe Municipality Awards Contract for 6,000 K.W. Turbine to Westinghouse

The Kobe municipality have just placed an order for a new 6,000 k.w. Westinghouse Parsons reaction type turbine generator, to replace the impulse type machine of another make which exploded not long ago, causing injury and death to several operators. This machine is of a late design, being the same as has been supplied to a number of companies in Japan. It is very similar in construction to the 5,000 k.w. machine now operating at the Amanogawa plant of the Dairen Light & Power Company.

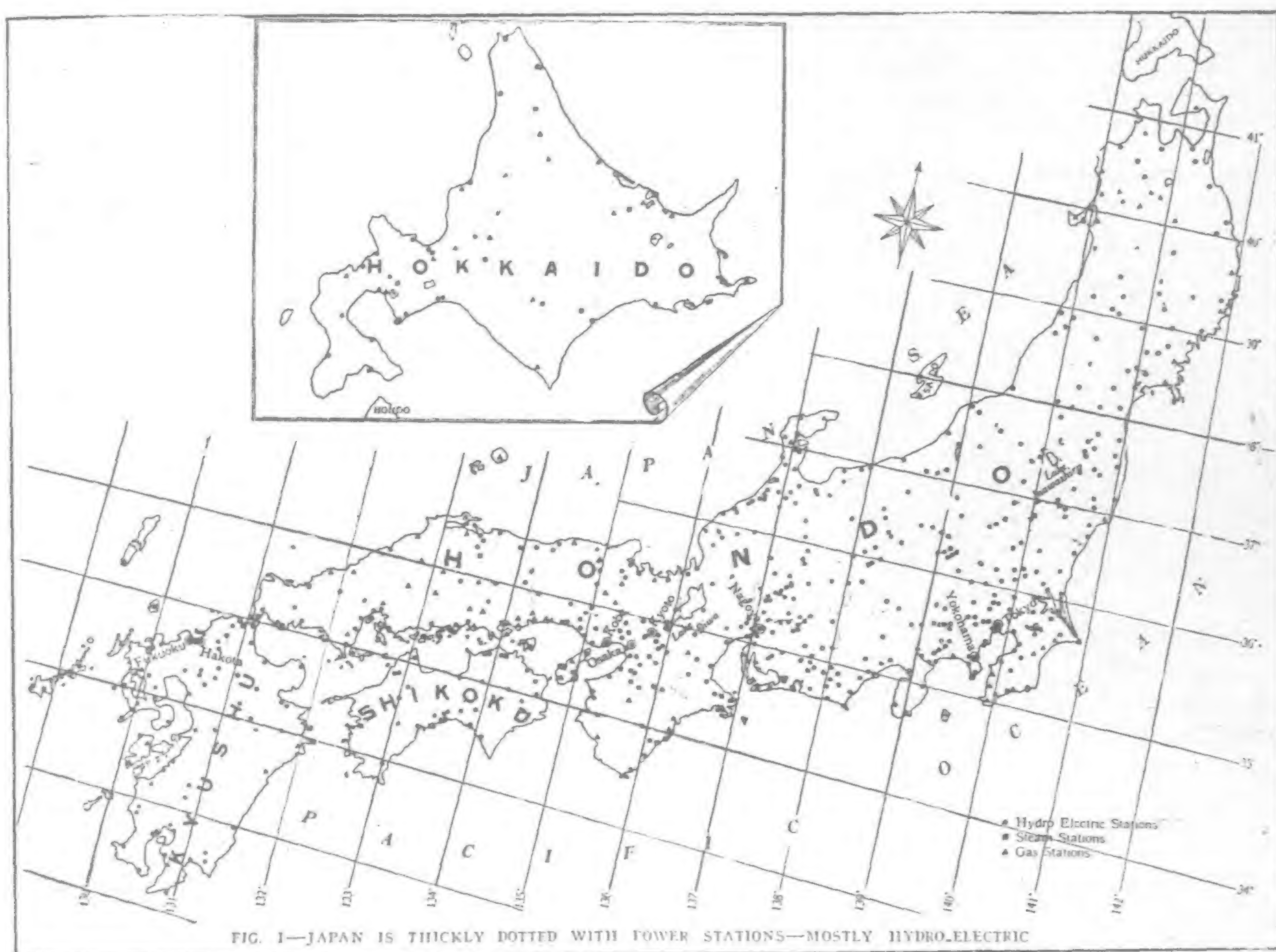
The 15,000 sq. ft. Westinghouse Le Blanc surface condenser, which had previously operated with the old 6,000 unit was uninjured, and consequently it will be used with the new Westinghouse unit. This equipment will operate in parallel with the 12,500 k.w. Westinghouse turbine generator which is now operating alone continuously, keeping Kobe supplied with light and power.

An order for another 6,000 k.w. turbine generator, similar to that ordered for Kobe, has been placed by the Imperial Government Railways. This will be complete with a 12,500 sq. ft. Westinghouse Le Blanc surface condenser, and will be an exact duplicate of the two existing units now in operation at the big Akabane station of the Imperial Government Railways, north of Tokyo. This power plant is now of exceptional importance, as the Yaguchi power station, such of Tokyo, has been badly damaged by the earthquake, and these Westinghouse units must carry the entire load of the electrified portion of the government railways, assisted only by such power as will be purchased from the Tokyo Electric Light Company.



General view of the Shibaura Engineering Works at Tokyo, destroyed by the quake and fire. A new and larger works are under construction





# Japanese High Voltage Power Transmission Systems

By S. Q. Hayes, General Engineer, Westinghouse Electric and Manufacturing Co.  
In The "Electric" Journal

Super-power systems in the eastern part of the United States and in California have been thoroughly discussed in the American technical press within the last few years, but little has been published about similar developments in other countries, so that Japan's progress in high-voltage power transmission should be of interest. In this article, it is the intention first to take up some of the more general features in connection with the larger power transmission systems and then to go into further details relative to certain interesting features of the generators, transformers, synchronous condensers, switching equipment or other important devices.

THE Japanese empire consists of a long chain of islands in the Pacific extending between 21 degrees 45 minutes and 50 degrees 56 minutes north latitude in a general direction from S. W. to N. E. The principal islands of Japan are the groups comprising the main island of Hondo with Hokkaido near the northern tip of the south-western part of Hondo. The Japanese empire also includes Taiwan or Formosa, Chosen (Korea) and Karafuto (the southern part of Saghalien) with many smaller islands comprising a total area of about 176,000 sq. miles and population of over 70,000,000.

From the electrical standpoint, Japan has been developed even more than the United States and has a greater portion of houses illuminated electrically than any other country in the world. As

the central portions of the main island are very mountainous and the rainfall in Japan is plentiful, hydro-electric developments are extremely numerous as shown in Fig. 1.

A very fair grade of coal is found in the island of Kyushu just off the southwestern tip of the main island of Hondo, and in parts of Hondo. Points on the main island, that can readily be reached by boat from Kyushu, have steam plants or gas lighting plants, while most of the interior towns and villages obtain their electrical current from hydraulic plants.

The principal electrical developments are on the main island centreing at Tokyo and Yokohama where 50 cycle current is employed and at Osaka, Kobe, Kyoto and Nagoya where 60 cycle current is used. The important load centres are near the southeastern coast between Tokyo and Osaka, these points being approximately 330 miles apart along the railroad.





Fig. 2—The Beginnings of a 154,000 volt Power System in Japan.

This should be considered as a schematic diagram of some of the principal systems, superimposed on a map. Most of the systems shown are now operating at 66,000 or 77,000 volts, but this voltage will be increased in the near future. 1, Daido Electric Company; 2, Nippon Power Company; 3, Ujigawa Electric Company; 4, Hakusan Hydro-Electric Company; 5, Tokyo Electric Light Company; 6, Gumma Electric Power Company; 7, Inawashiro Hydro-Electric Company; 8, Kinugawa Electric Power Company; 9, Katsuragawa Electric Power Company.

For the transmission of large amounts of power and for tying together the scattered plants of the large systems such as the Daido, Tokyo, etc., 154,000 volts has been determined on as the voltage for the step-up transformers at the generating stations. For the main receiving stations at points like Osaka and Tokyo, the voltage on the main transmission lines will be maintained at approximately 140,000 by means of synchronous phase modifiers. The voltage regulators on the phase modifiers will be controlled by potential transformers on the secondary distribution bus—55,000 volts at Osaka, 11,000 or 22,000 volts at Tokyo and will tend to hold these voltages constant.

Most of the power in the Tokyo district is distributed by the Tokyo Electric Light Co., and is developed either under that name or under the name of one of the subsidiaries such as Shinyetsu, Kaihin, etc. Power is also received from the Inawashiro, Gumma and Kinugawa Companies. Most of the power delivered to Nagoya, Osaka, and

Kyoto is developed under the name of Daido Company or one of its subsidiaries, or under the name of the Nippon Company or one of its affiliated companies such as the Ujigawa (Uji River) Power Co. Kobe has its own municipal electric plant. The western end of the island of Hondo between Kobe and Moji is known as the Sanyo and Sanin district, and contains the Sanyo Water Power Co. in the Hyogo prefecture, the Bisaku Electric Co. at Okayama, and the Hiroshima Electric Co. an amalgamation of the Hiroshima Kure Electric Co., the Hiroshima Electric Lighting Co. and the Shikoku Electric Power Company.

For the Daido system the total generating station output, including extensions contemplated within the next ten years, amounts to 640,000 kw. The receiving stations will have a total installed capacity of 560,000 kw. All of the Daido lines, transmitting power to Nagoya and Osaka, are for 60 cycle service, while those that are proposed to transmit power to Tokyo will be for 50 cycle service. Some of the proposed generating stations of the Daido Co. will be able to supply either 50 cycle or 60 cycle service.

The contemplated 154,000 volt lines of the Daido Electric Co. constitute a super-power system of very considerable magnitude, particularly in view of the fact that the 154,000 volt lines of the Tokyo Electric Lighting Co. and its various subsidiaries, tying in at Tokyo, will doubtless be connected with the 154,000 volt Daido lines, if they are extended to Tokyo. In a similar manner, a competing company, the Nippon Power Co. is transmitting power into Osaka at 154,000 volts and is arranging for a number of tie connections to the Daido and to other power systems.

The electrification of the Imperial Government Railways will also be carried out at 154,000 volts, power being transmitted from their proposed Shinanogawa (Shinano River) plant to a main receiving station at Kichijoji in the outskirts of Tokyo. When these various 154,000 volts systems reach their contemplated development, there will be 3,000 to 5,000 miles of circuits, all more or less tied together.

In the Osaka region, there are at present various 77,000 volt transmission systems that will be connected to the Daido and the Nippon systems, through suitable transformer stations. In a

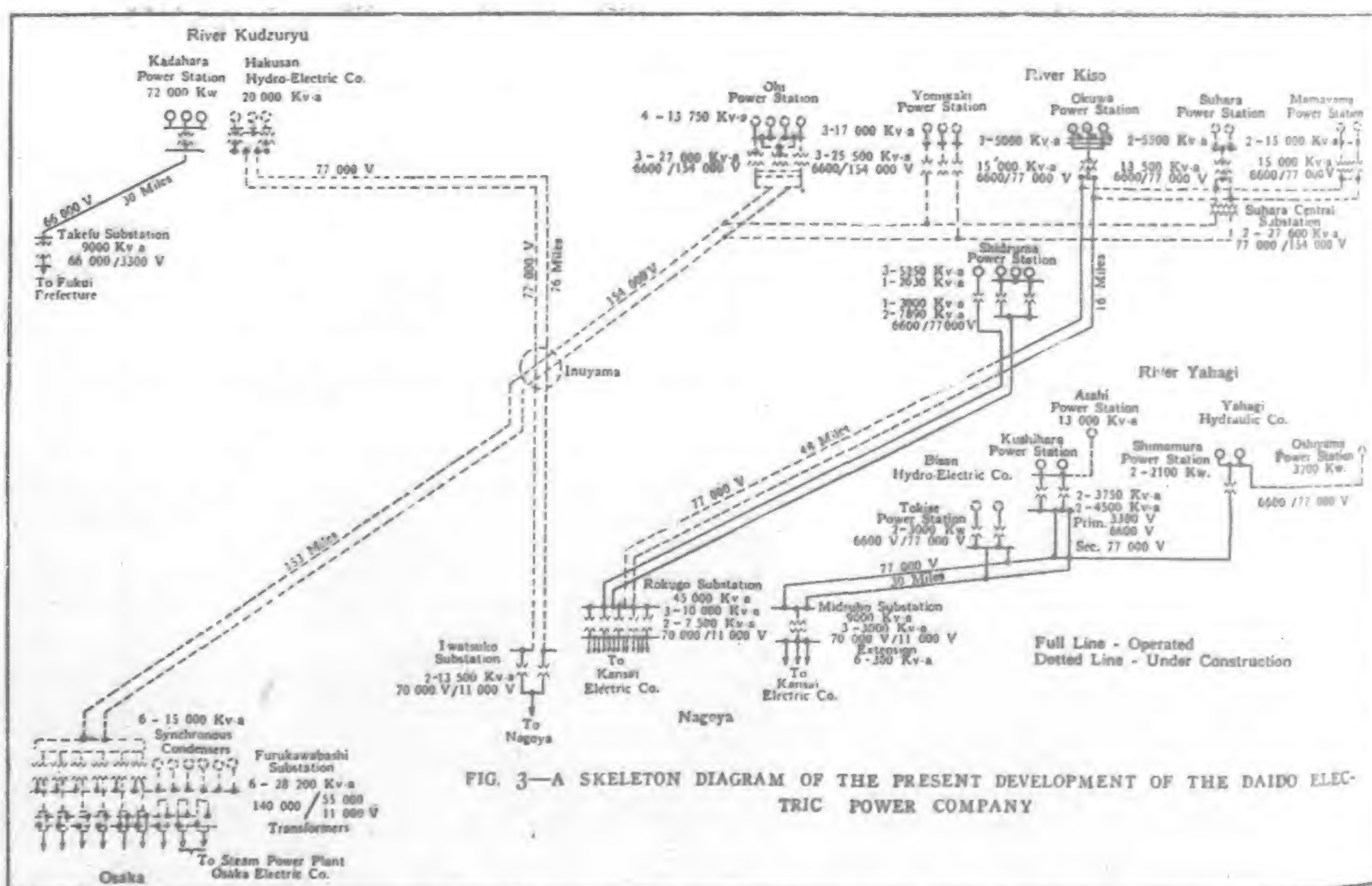


FIG. 3—A SKELETON DIAGRAM OF THE PRESENT DEVELOPMENT OF THE DAIDO ELECTRIC POWER COMPANY



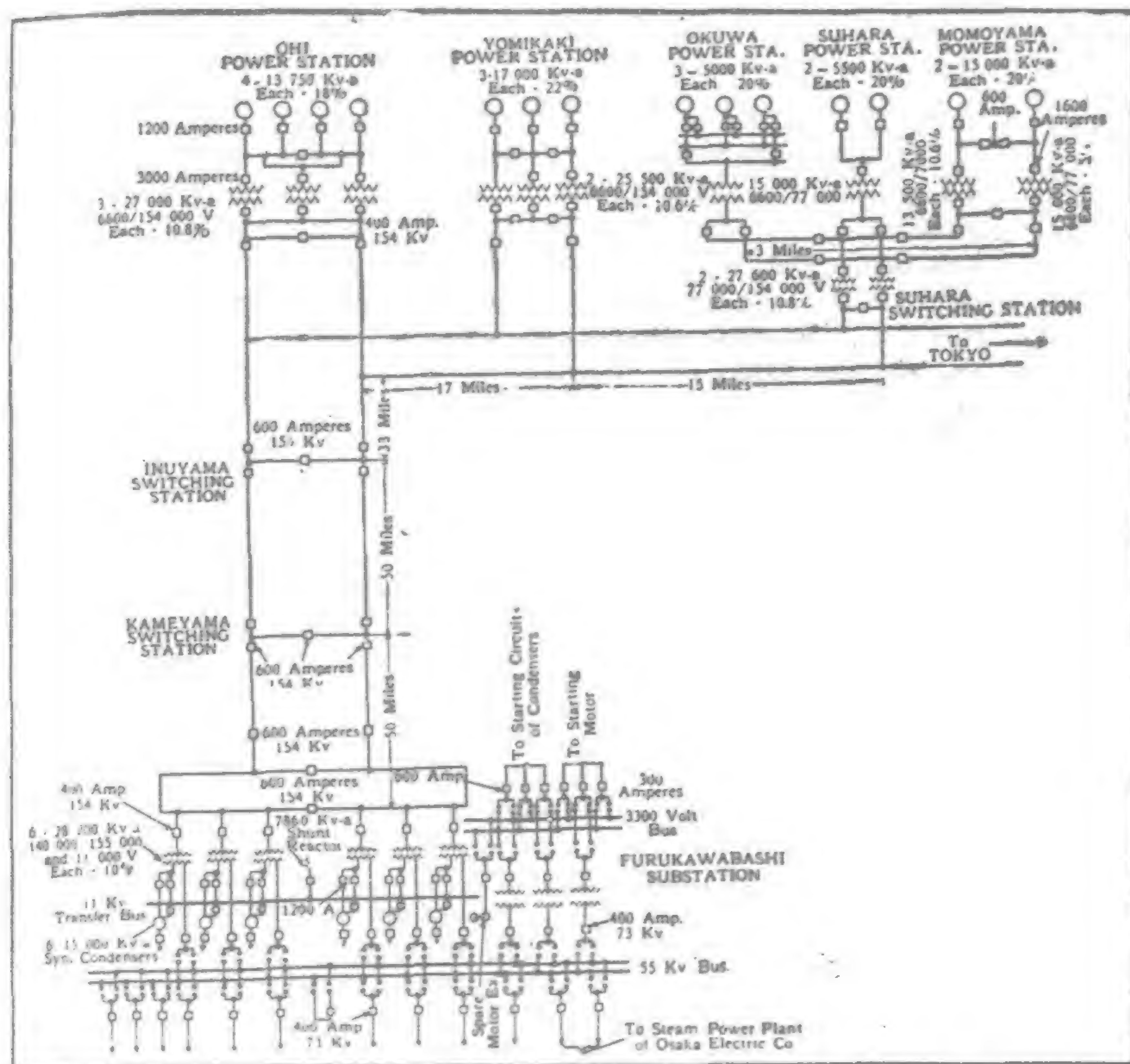


Fig 4.—Switching Scheme of the 154,000 volt lines of the Daido Electric Power Company

similar manner, in the neighborhood of Tokyo, there are various 66,000 volt transmission systems forming part of the present Tokyo system. The Tokyo Electric Light Company receives power transmitted at 115,000 volts from the Inawashiro Co., and provision will likely be made for tying in with the 115,000 volt system of the Gumma Power Co.

From the foregoing, it may be seen that 154,000 volts has been selected by the Japanese imperial government as the voltage for their super-power system and all of the principal power transmission systems. The secondary distribution of large amounts of power in the Tokyo district is at 66,000 volts, while at the Osaka neighborhood it is 55,000 volts. The local distribution around Tokyo and around Osaka is 11,000 volts with provision made for later changing to 22,000 volts. This 11,000-22,000 volt distribution feeds a large number of substations where the voltage is stepped down to 3,300 volts for general distribution.

The city of Tokyo, the capital of Japan, has about two and a half million inhabitants and is growing rapidly. It has an excellent system of tram cars, an electrified belt line railway, and practically every house, even the smallest, is illuminated electrically.

Yokohama, eighteen miles away, is the port for Tokyo, and has about a quarter of a million inhabitants. The main railway line between Tokyo and Yokohama has four

tracks, two for steam trains and two for electric trains operating on a twelve minute headway. Between Tokyo and Yokohama is a very busy industrial section with all of the factories electrified and most of them receiving power from the various hydro-electric transmission systems.

Osaka is a city of about one and a quarter million inhabitants and is the principal industrial city of Japan. Kobe, the chief port for Kyoto, is twenty miles from Osaka and has a population of five hundred and fifty thousand. Kyoto, the old capital of Japan, which has five hundred thousand inhabitants, is within an hour's ride of Osaka.

If all of the present plans are carried out, the power supply for the Tokyo district by the end of this decade, will be about 1,000,000 kv-a and the same amount will be installed for the Osaka district. The difference in frequency complicates the tying together of these systems. Up to the present, all of the 154,000 volt transformers switching equipment, and a large portion of the generators and lower voltage apparatus have been ordered from America so that the practice is essentially the same as in America.

### Daido Electric Power Co.

The Daido (consolidated) Power Co. is an amalgamation of a number of power companies, all controlled by a group of Japanese financiers headed by Mr. Fukuzawa. Under the name of the Kyushu Electric Light & Railway Company, control is exercised by Mr. Fukuzawa over the power and railway developments in the northern part of the island of Kyushu, centring in Fukuoku and Hakota.

At present the Daido lines are used principally for furnishing power to Nagoya and Osaka, and most of the equipment now being

built for the Daido Company will be used for the transmission to Osaka. To provide the two frequencies required for transmitting power to the Osaka, Nagoya and the Tokyo district, certain generating stations such as Momoyama are provided with waterwheels and generators suitable for operating at two speeds having a ratio of 5 to 6. It is very probable that from the Daido line connections will be made to the present system of the Tokyo Electric Light Company, and tie connections will be

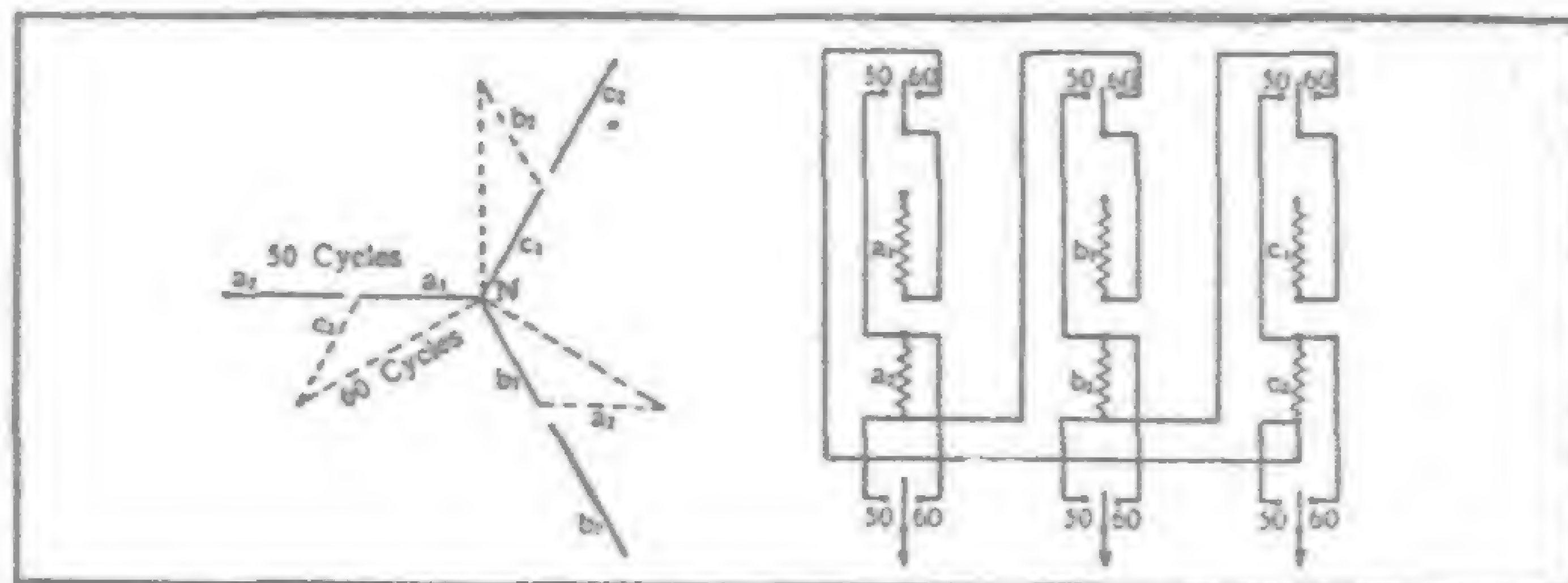
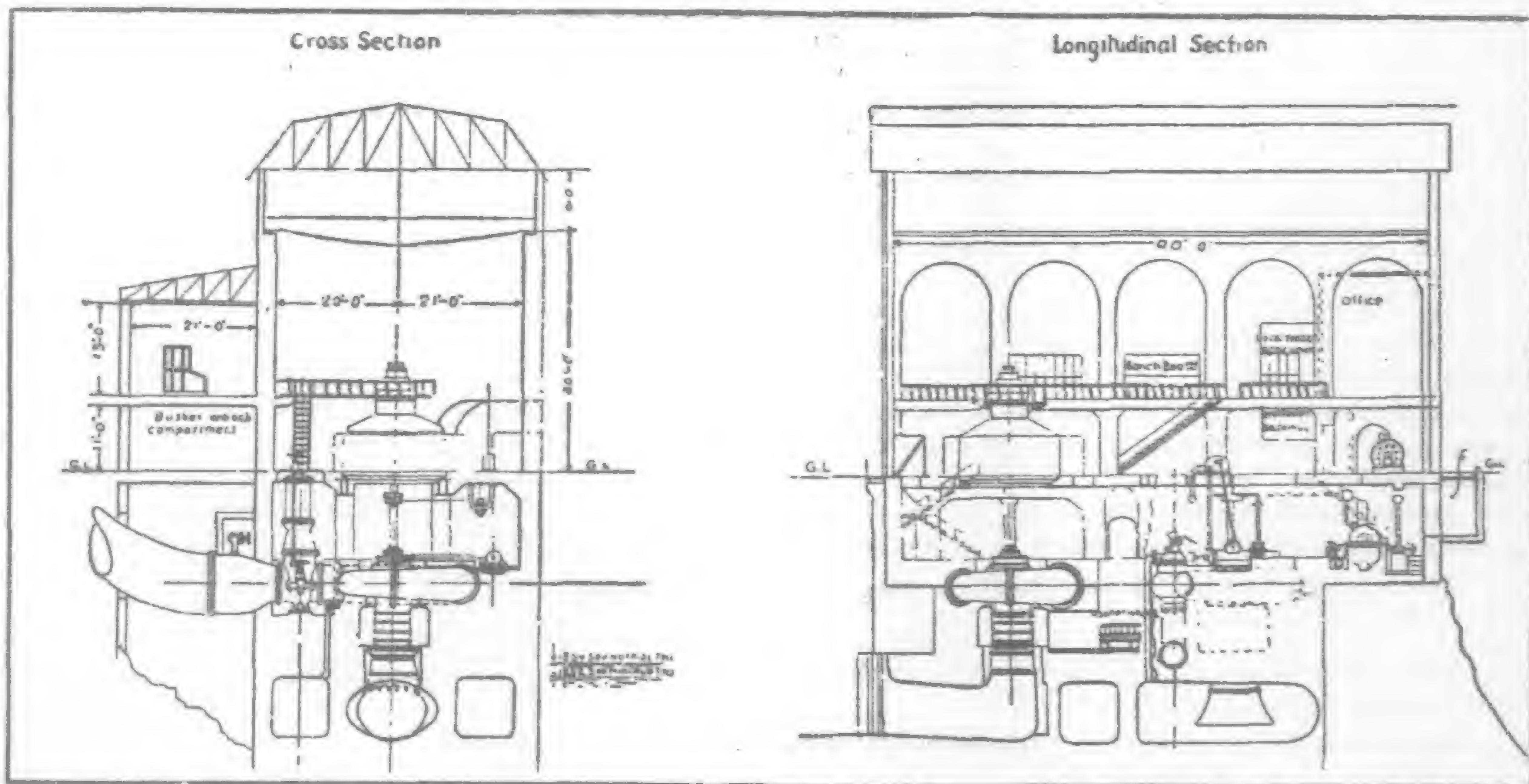


Fig. 6.—Scheme of Generator Connections to give 50 or 60 cycles at Momoyama

made to the Imperial Government Railways transmission system. At Osaka parallel connections are now made to steam



Section through Momoyama Station



plants of the Osaka Electric Light Company containing approximately 125,000 kv-a in turbo-generators.

The Nippon Power Company, now a rival transmission system into Osaka, may possibly be amalgamated later with the Daido system. This power company operates the power transmission system from the Ibigawa and Seto installations. In Osaka, the Nippon Company transmission line operates in parallel with the steam plant and the hydroelectric transmission line of the Ujigawa (Uji river) system.

Fig. 3 shows in skeleton form the main scheme of connections for the present water power developments of the Daido system on the Kiso, Kudzuryu, and Yahagi rivers for delivering power to Osaka and Nagoya. On this diagram, the full lines are now in operation at 77,000 volts supplying power to Nagoya and at 66,000 volts to Fukui prefecture (county). Lines are now under construction for 77,000 volts transmission to Nagoya and 154,000 volts transmission to Osaka. Fig. 4 shows more fully the main connections from the five important plants along the Kiso River used for the Osaka transmission.

The portion of the equipment now being built or which was installed for the Osaka transmission is that shown on Fig. 4 and comprises generating stations at Okuwa, Suhara, Yomikaki, Ohi and Momoyama, these being installed in this order with a step-up transforming station at Suhara, switching stations at Inuyama and Kameyama with main receiving station at Furukawabashi near Osaka.

At the Okuwa power station Fig. 5 there are three vertical shaft waterwheels, each driving a 5,000 kv-a, 60 cycle 6,600 volt generator. For use with these generators, exciters were furnished driven by horizontal shaft waterwheels. In this station there is a bank of three 5,000 kv-a 6,600-77,000 volt transformers. This Okuwa power station is approximately three miles from Suhara, where the main step-up transforming station will be located. The switching equipment at Okuwa is so arranged that the three generators, of which one is considered a spare, can operate on either of two sets of busbars. The transformer bank connects through suitable circuit breakers to the low-tension busbars and, on the high side, two circuit breakers are furnished for connecting to either of the two transmission circuits. At this station indoor apparatus is used, although there are some outdoor 77,000 volt disconnecting switches located just outside of the building.

At Suhara generating station there are two vertical shaft waterwheels each driving a 5,500 kv-a generator very similar to those supplied for Okuwa. In this plant are three 4,500 kv-a transformers stepping up from 6,600 to 77,000 volts. The distance from the Suhara generating station to the Suhara transforming and switching station is very short and they might almost be considered the same installation. The control desk equipment for the transformer station is the only indoor equipment at that plant as the transformers and switching equipment are all arranged for outdoor service.

At the Suhara transforming station there will be installed seven single-phase oil-insulated water-cooled transformers of the shell type construction for outdoor service. These will be used as two three-phase banks with one spare transformer for tying together, at this point, the 77,000 volt Nagoya transmission and the 154,000 volt Osaka lines. In the course of a few years provision will be made for 154,000 volt lines from Suhara to Tokyo and, as these will have to operate at the Tokyo frequency of 50 cycles, provision is made for operating the Suhara transformers, as well as the Momoyama generating station at either sixty cycles for the Osaka lines or 50 cycles for the Tokyo lines.

The transformers are rated for a maximum continuous output of 9,200 kv-a at 60 or 50 cycles and are designed for a voltage ratio, based on the turn ratio, of 77,000 to 89,000 volts, three transformers being connected in a three-phase bank with the primary in delta and the secondary in star to step up the voltage from 77,000 to 154,000 volts.

The switching equipment at this Suhara transforming station is arranged for the control of the following circuits:—

Two—10,000 kv-a—77,000 volt incoming lines from Suhara generating station

Two—15,000 kv-a—77,000 volt incoming lines from Okuwa generating station

Two—30,000 kv-a—77,000 volt incoming lines from Momoyama generating station

Two (later three) 27,600 kv-a transformer banks, 77,000-154,000 volts

Two—55,000 kv-a—154,000 outgoing lines.

In this station the two incoming lines from each of the generating station at Okuwa, Shuara and Momoyama connect through suitable circuit breakers and disconnecting switches to the 77,000 volt bus. Two transformer banks (with provision for a third one) connect through circuit breakers and disconnecting switches to this bus, and each transformer bank is provided with choke coils. The high-tension sides of these transformers connect to the 154,000 volt bus and supply power to the two outgoing lines.

At the Momoyama station there are two vertical shaft waterwheels each driving a 15,000 kv-a generator. These units operate at 250 r.p.m. for 50 cycle service, with their windings connected in star or operate at 60 cycles, 300 r.p.m. with their windings in interconnected star. The generators have twelve terminals brought out from the armature and the equivalent of a six pole double-throw switch connected as in Fig. 6 which takes care of the change from straight star for 50 cycle service to interconnected star for 60 cycle. As the ratio voltage for the two schemes of connections is 100-87 and the ratio of speed is 82.5-100, very little field adjustment is needed to insure the same voltage at either frequency.

The generators will be closed at the top, the air for ventilation being taken from underneath and discharged through openings in the stator frame into a housing. To avoid the heated air from the generators making the generator room unpleasantly warm, a sheet iron cover is to be put around each machine after installing, with suitable space between cover and frame connected to a duct in the foundation for carrying off the heated air. The upper bearing bracket, carrying the upper guide bearing, thrust bearing and exciter, has iron plate covers of ample thickness between the arms. The thrust bearing is of the Kingsbury type.

Each generator is provided with its own 320 kw direct-connected exciter, and there is a spare motor-driven exciter of the same capacity. The switchboard galley is at the height of the generator platform and contains the control desk, local service board, bus bars, etc., while the low-tension circuit breakers are located on the same level as the generator room.

The outdoor transformers for this station comprise seven 5,000 kv-a single-phase units arranged in two banks, with one spare, for stepping up from 6,600 to 77,000 volts, delta-delta.

Okuwa, Shuara and Momoyama generating stations on the Kiso River are normally operated together as a group supplying power at 77,000 volts 60 cycles to Nagoya, or through the Suhara transforming station supplying power at 154,000 volts to Osaka. When it is necessary to supply 50 cycle power to Tokyo the Momoyama generators will be run at 250 r.p.m. and one of the Suhara transformer banks will be fed at 50 cycles from Momoyama feeding to Tokyo and the other at 60 cycles from Okuwa and Suhara feeding to Osaka.

At the Yomikaki power plant, there are three vertical shaft waterwheels each driving a 17,000 kv-a, 60 cycle, 6,600 volt generator with exciter specially designed for line charging conditions. This plant contains two 25,000 kv-a, 6,600-154,000 volt transformer banks and complete switching equipment. Yomikaki is approximately 15 miles from Suhara and 17 miles from Ohi.

At the Ohi generating station there are four vertical shaft waterwheels each driving a 13,750 kv-a, 60 cycle, 6,600 volt generator, and two 675 kw waterwheel-driven exciters. At this station there are three banks of transformers stepping up from 6,600 volts delta to 154,000 volts star. Each bank comprises three 9,200 kv-a single phase units corresponding closely with the transformers for the Suhara station, except for the lower primary voltage. The switching equipment for the Ohi station comprises a nine section control desk and the separately mounted apparatus for the control of four generators, three transformer banks and two 154,000 volt lines. Normally the output of two generators will supply a transformer bank and each transformer bank will supply its own transmission line. The third transformer bank is a spare. Some of the important elements of the switching equipments are described later.

The Inuyama switching station, located 33 miles from Ohi, provides the necessary oil breakers with disconnecting switches for sectionalizing or joining the lines at this point. Hornbreak switches take care of the tie connections to the Hakusan lines. Fifty miles from Inuyama is located the Kameyama switching station with oil circuit breakers and disconnects for sectionalizing and tie connections.



The Furukawabashi substation in the outskirts of Osaka is fifty miles from Kameyama. Here provision is made for two 75,000 kv-a incoming lines each with an emergency capacity of 150,000 kv-a. These lines tie to a ring bus which in turn, feeds six 28,200 kv-a transformer banks, these banks being made up of three 9,400 kv-a transformers. These transformers are connected in star for 140,000 volts primary, in star for 55,000 volts secondary and in delta for 11,000 volts tertiary, this latter winding being used for supplying power to synchronous phase modifiers.

There are three 15,000 kv-a synchronous phase modifiers with 125 kw direct-connected exciters and one 125 kw motor-driven exciter. There are also three 15,000 kv-a synchronous phase modifiers provided with wound rotor motors that can be used either for the purpose of starting the phase modifier or actually driving it as a generator for a short period of time for the purpose of testing out a transmission line.

The main connections are so made that the two incoming lines connect to the two sections of a 140,000 volt ring bus and each section supplies three 28,200 kv-a transformer banks. The secondary, 55,000 volt, windings of the transformers connect through a circuit-breaker and two sets of disconnecting switches to either, or both of two 55,000 volt bushars that supply power to ten present feeders with provision for four more feeders. Fed also from these 55,000 volt busbars are two 825 kv-a three-phase transformers and a 2,500 kv-a three-phase transformer stepping down to 3,300 volts for local service, the starting of the phase modifiers, the operation of the driving motors and the motor-driven exciter.

The tertiary, 11,000 volt winding of the main transformers is used chiefly for the supply of current to its own phase modifier. The tertiary winding and the corresponding phase modifier have three oil circuit-breakers, one connecting the transformer directly to the phase modifier, the second connecting the transfer bus to the phase modifier and the third connecting the transfer bus to the transformer winding. With this arrangement of circuit-breakers, there are two alternative paths for the current from the transformer to the machine, one direct, independent of the bus, and the other

by connection to the bus. Any one of the three circuit-breakers can be cut out for inspection, adjustment or repairs without shutting down the transformer or the phase modifier.

There are 18 three-winding transformers at Furukawabashi. Each transformer is rated for a maximum continuous output at 60 cycles of 9,400 kv-a on the primary winding, 9,400 kv-a on the secondary and 5,000 kv-a on the tertiary. It is designed for a voltage ratio, based on the turn ratio, of 80,800 volts to 31,800 and 11,000 volts, three transformers being connected in a bank with the primary and secondary in star connection and the tertiary in delta to step-down the voltage from 140,000 to 55,000 and 11,000 volts. The transformers are equipped with a tap on the high voltage winding for 72-720. This permits temporary operation from some 77,000 volt lines to Osaka.

The 55,000 volt feeders from Furukawabashi connect in with the distribution of power from the steam stations of the Osaka Electric Light Co. where there are two 25,000 kv-a turbogenerators now being installed at the Kasugade No. 2 station: four 12,500 kv-a and two 6,250 units at other stations.

Among the old Daido stations, the Shidzumo plant contains three 5,250 kv-a 6,600 volt generators, one 3,000 kv-a, 6,600 volt generator, two banks of transformers fed from the 5,250 kv-a machines, each comprising three 2,630 kv-a units, 6,600/77,000 volts and one 3,000 kv-a, three-phase transformer, 6,600/77,000 volts used with the 3,000 kv-a machine.

For the Sango substation, switching equipment is being furnished for interconnecting the Furukawabashi station at Osaka, the Moriguchi substation, Keihan Electric Co. and the Kema steam power plant. In this station there will be installed three 5,000 kv-a 55,000-22,000 volt transformers.

For the Iwatsuki substation near Nagoya, there will be installed six 4,000 kv-a transformers, 77,000-11,000 volts now being built in America. Switching equipment for this installation is being furnished by local Japanese makers.

(To be continued).

## ELECTRICAL DEVELOPMENTS IN CHOSEN AND JAPAN

THE total capitalization of electrical enterprises in Chosen is Y.65,000,000 of which Y.24,000,000 is paid up. The total power generated is 49,000 kilowatts, supplying 505,000 electric lights, and 7,600 h.p. in industrial works.

Compared with pre-annexation days the paid-up capital of the electric companies has increased eight times, and power generated, 45 times.

Electric development in Chosen includes many water power schemes, and applications for licenses are being favorably considered by the government general.

The Kongosan Suiryoku Denki Kabushiki Kaisha (Mr. Kongro Hydro-Electric Co., Ltd.) has obtained a license to distribute power in Seoul. This is the first long-distance transmission scheme in Korea, and its progress is being watched with great interest.

The Shinetsu Denryoku Kabushiki Kaisha (the Shinetsu Electric Power Co., Ltd.) has recently made application to the Sendai bureau of the department of communications for permission to construct a hydro-electric power plant on the Shinano

River, at an estimated cost of Y.73,700,000. This is the much-talked-of Shinano River power project which is to supply power for the electrification of the Tokaido railway between Tokyo and Numadzu.

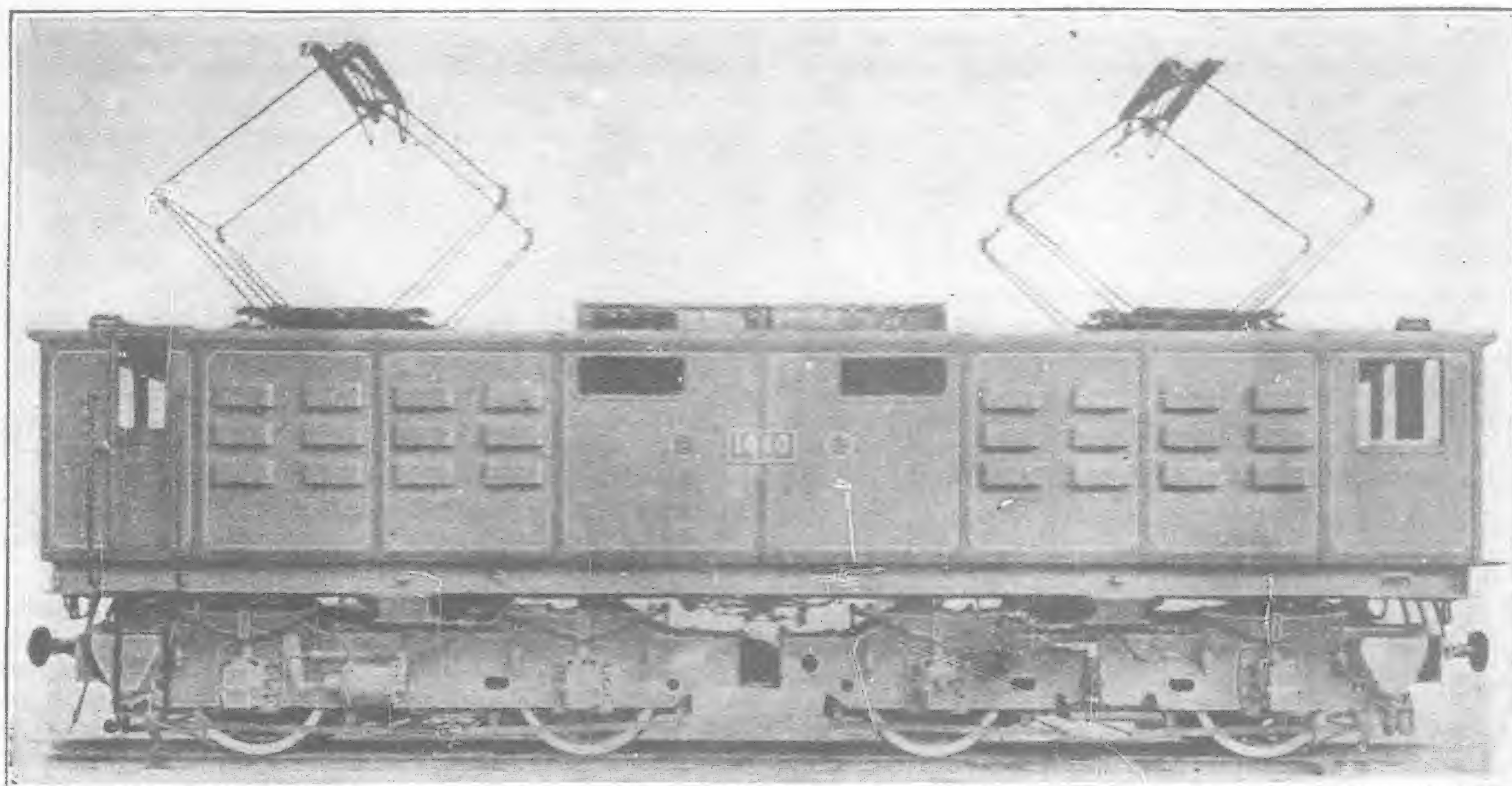
The Shinano River will be dammed in Nagano prefecture, from which point a canal will extend a distance of 6 ri (about 15 miles) to a point in Niigata prefecture, where the fall to the generating station will be 358 shaku, about 108.5 metres. Nine water turbines will be installed and fed through pipes 1,068 shaku, about 324 metres, long. Each turbine will have a capacity of 28,000 h.p., so that the total capacity of the plant will be 250,000 h.p.

The application states that construction will be completed in November, 1926. Power will be transmitted to Tokyo and the Kwanto district. This power plant will have four times the capacity of Inawashiro Suiryoku K.K., with 55,000 h.p. and is the largest single power plant ever contemplated in Japan. It has the same capacity as all the power plants in the six prefectures of northeastern Japan, including Niigata prefecture.



The Shinano River: showing exact site of dam under construction to store the water for operating the great 250,000 H.P. power house of the Shinetsu Electric Power Co., Ltd.





One of the 36 Electric Locomotives supplied to the Imperial Japanese Government Railways by the English Electric Company, Ltd.

## English Electric Locomotives for Japan

**T**HE English Electric Company is making deliveries on its order for 34 electric locomotives from the Imperial Japanese Government Railways. The first of these locomotives was shipped in February and the remainder were completed by August.

Before deciding on their electrification program the Japanese government railways investigated the electric railway systems of the world and studied the designs of electrical equipment constructed by the principal manufacturers. As a result of this enquiry they determined to adopt a high tension direct current system, and in all future work direct current at 1,500 volts with a single overhead conductor will be employed. In 1921 the railway authorities ordered two 59-ton (ton equals 2,240-lb.) freight locomotives from each of four firms, two American, one Swiss and in England the English Electric Company. In June, 1922, a contract was placed with the English Electric Company for a further order of 34 electric locomotives, this being the whole number required to carry through the program of the Japanese government up to the end of 1923. The illustration shows one of the completed locomotives. This is the largest contract for electric locomotives which has yet been carried out entirely by British manufacturers. The mechanical parts of the locomotives have been built by the North British Locomotive Company at their works in Glasgow, Scotland, and the electrical equipment at the Dick Kerr works of the English Electric Company, where each locomotive is erected for inspection and test before shipment.

The locomotive illustrated is one of 17 which will be used entirely for freight service; 9 others are being built for hauling local passenger trains, and 8 of a heavier type for the express passenger service. The freight and local passenger locomotives are similar throughout except in the gear ratio, which is so adjusted as to give for the former a maximum speed of 40 miles an hour and for the latter one of 53 miles an hour. These locomotives are of the 0-4-4-0 type and weight 59 long tons each. The weight is evenly distributed on the axles and comes just within the limit weight per axle of 15 metric tons enforced on the Japanese government railways. The aim which it has been sought to attain in the construction of the mechanical parts is to provide a sound and robust locomotive well-proportioned and of excellent finish, and generally to ensure that throughout the locomotives should represent the best British engineering practice. The locomotive trucks are articulated so that drawing and buffing stresses do not go through the superstructure. The monitor and part of the sides can be readily removed to allow erection and dismantling of motor generator sets and compressors, etc.

Each locomotive is equipped with four motors each of 306 h.p. arranged in groups of two in permanent series. The control is the "English Electric" electrically operated camshaft type, which provides series and parallel control and also two field shunting

notches. The control is arranged for multiple unit operation so that two or more locomotives can, if necessary, be operated from one driving point.

The control voltage is 120 volts which is obtained by means of the motor generator set and this set also drives the fans employed in the forced ventilation of the motors.

The pantographs are raised by air and are so arranged that any one of them can be raised or lowered independently of the others and that all the pantographs on a train can be raised or lowered simultaneously from any driving point. The locomotives are arranged with a driver's cab at each end and the centre portion of the superstructure is occupied by the control equipment, air compressors and main resistances. All the high tension apparatus is in closed compartments and suitable interlocking is provided so that these compartments cannot be opened without the high tension apparatus being disconnected from the line. The locomotives are equipped with Westinghouse straight and automatic air brakes.

The eight express passenger locomotives are of the 4-6-6-4 type. The superstructure is mounted on two articulated trucks each with a swivelling bogie and three driving axles. The locomotive weighs 96 long tons, there being 12 tons on each driving axle and 12 tons on each swivelling bogie. The electrical equipment includes 6 motors each of 306 h.p., the same motor being used as on the freight and local passenger locomotives. These motors are also arranged in groups of two in permanent series. In other details the equipment of these express locomotives is also similar to that of the type already described.

## Wireless Telephones for Nagasaki Fishing Boats

**T**HE chief of the Nagasaki prefectural marine products bureau, together with a committee of men interested in marine products, is reported to be investigating the possibilities of installing wireless telephone outfits on the larger-sized fishing boats which have their base at Nagasaki, to enable them to communicate with shore when in difficulties, and to report the catch in time for their owners to realize on it. The recent success of the Fukuoka-Fusan wireless-telephone tests has been the immediate cause of this interest in more practical applications of wireless telephony.

There are about 150 fishing boats on which wireless telephone equipment might be installed, and though they frequently go to distances from shore too great for direct communication, it is believed that a system of relays could be developed by which messages could be sent through to land. While wireless sets of Japanese manufacture will doubtless be favored where suitable equipment can be obtained locally, the owners of some of the larger boats ought to be interested in American-made sets.



# Steel Works Electrification

THE most important steel works reconstruction carried out in Great Britain for many years is now being undertaken by The Consett Iron Company who are modernizing their steel works and plate mills. The work on the coke ovens and steel furnaces is well advanced and the orders have now been placed for the new mill buildings, rolling mills and electrical drives.

This reconstruction involves four entirely new mills, consisting of:—

- A 40" Slabbing Mill,
- A 42" Plate Mill,
- A 32" Light Plate Mill, and
- A Chequer Plate Mill.

As was to be anticipated, the whole of the plant will be electrically driven, and as the slabbing and plate mill are of the two-high reversing type the drives will be on the Ilgner system.

The main reversing motors direct coupled to the mills will be duplicates and will each consist of a double-armature motor designed for a maximum power of 14,000 h.p. between any speed of  $\pm 50$  to 100 r.p.m. A typical view of the mill motors is shown in Fig. 1.

The flywheel Ilgner sets supplying the mill motors will again be duplicates and will each consist of a 2,500 h.p., three-phase induction motor coupled to two variable voltage generators and a built-up steel flywheel, 48-tons in weight, 11-ft. 3-in. in diameter. The synchronous speed of the sets will be 600 r.p.m.

Under normal working conditions it is proposed to mechanically couple the two sets together, end to end, so that full use of the equalising effect of the two flywheels will be rendered available for steadying the load demand from the station. Fig. 2 shows a typical flywheel set in which the arrangement of the machines is clearly shown.

By introducing the flywheel between the two variable voltage generators the power transmitted from the flywheel passes in two directions, thus avoiding excessively heavy shafts. The length of

the set is reduced to a minimum by the avoidance of any flexible couplings, the whole set being carried by five bearings.

The light plate mill is of the three-high type, and will be driven by a continuous running induction motor with a normal output of 2,500 h.p., 240 r.p.m. A flywheel of approximately 35 tons in weight, 15-ft. in diameter, will be coupled between the motor and the pinion, housing, this later acting, in addition, as a reduction gear to give a suitable speed on the mill.

The chequer mill will consist of a single two-high stand of rolls and will be driven by a three-phase induction motor of 750 h.p. running at 240 r.p.m., a flywheel 20 tons in weight, 8-ft. 6-in. in diameter, being interposed between the motor and the gearing.

The type of induction motor for the light plate mill and chequer mill, is shown in Fig. 3.

The new mills will be of Messrs. Davy Bros.' manufacture whilst the electrical plant will be supplied by Messrs. The English Electric Co., whose experience of rolling mill work is well known.

The two reversing drives now to be supplied will make the reversing mill equipments built by this firm 15 in number.

To provide the necessary power the Consett Co. have on

order two 3,000 k.w. generator sets, of which the turbines and condensers will be built by Messrs. Belliss and Morcom, Ltd., and the alternators and condensing plant motors will be of The English Electric Co.'s manufacture. Power will be generated at 3,300 volts, 40 cycles, 3-phase, the periodicity being chosen so that additional power can be drawn from the mains of The Newcastle Electric Supply Co., and the County of Durham Electric Power Supply Co., Ltd., when desired, or conversely any surplus power can be delivered into the power company's mains.

The Consett Company have been well-known manufacturers of plates for many years, and this new plant will put them in an exceptional position to meet modern conditions.

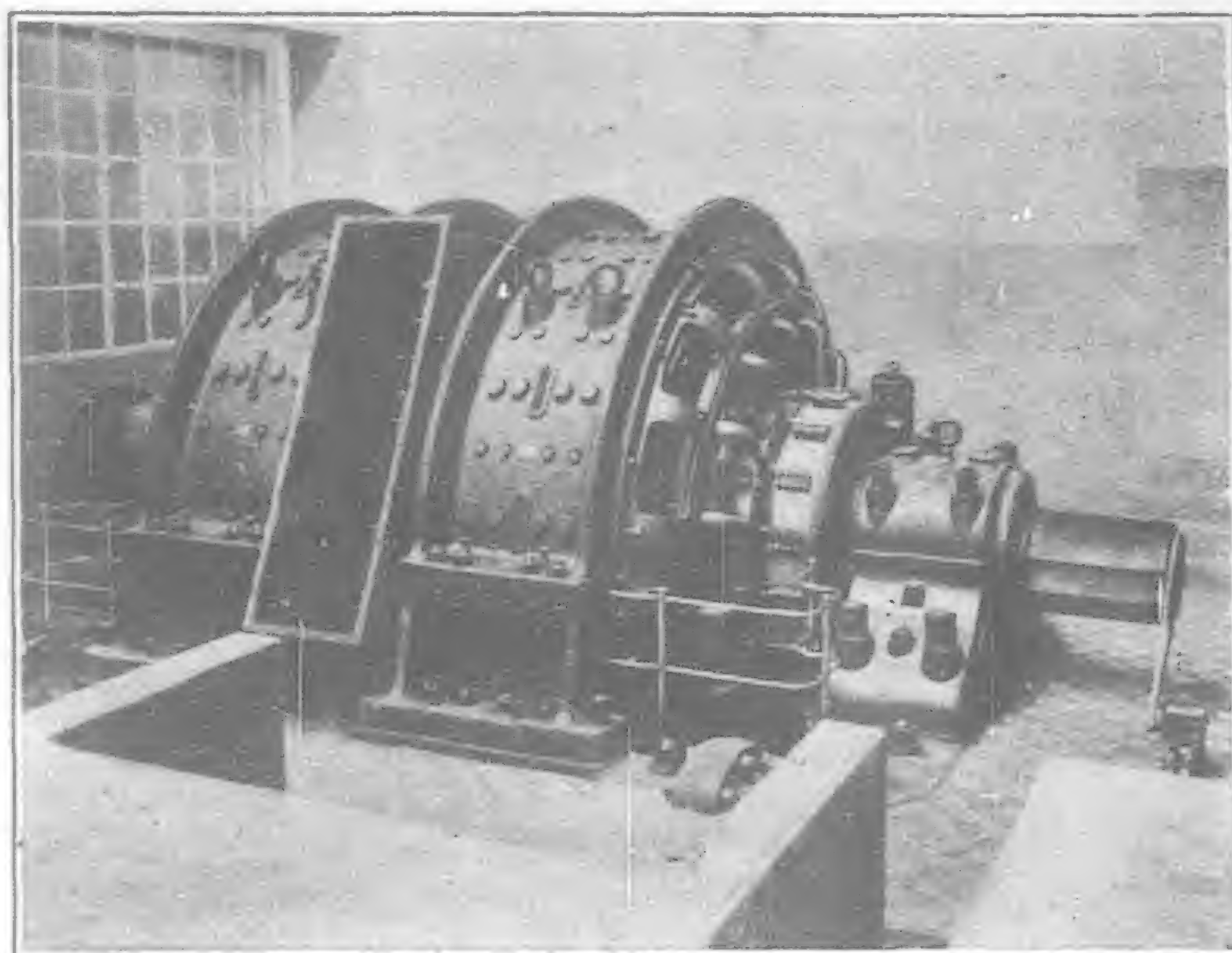


Fig. 1.—Typical view of the Mill Motors—illustration by the English Electric Company, Limited

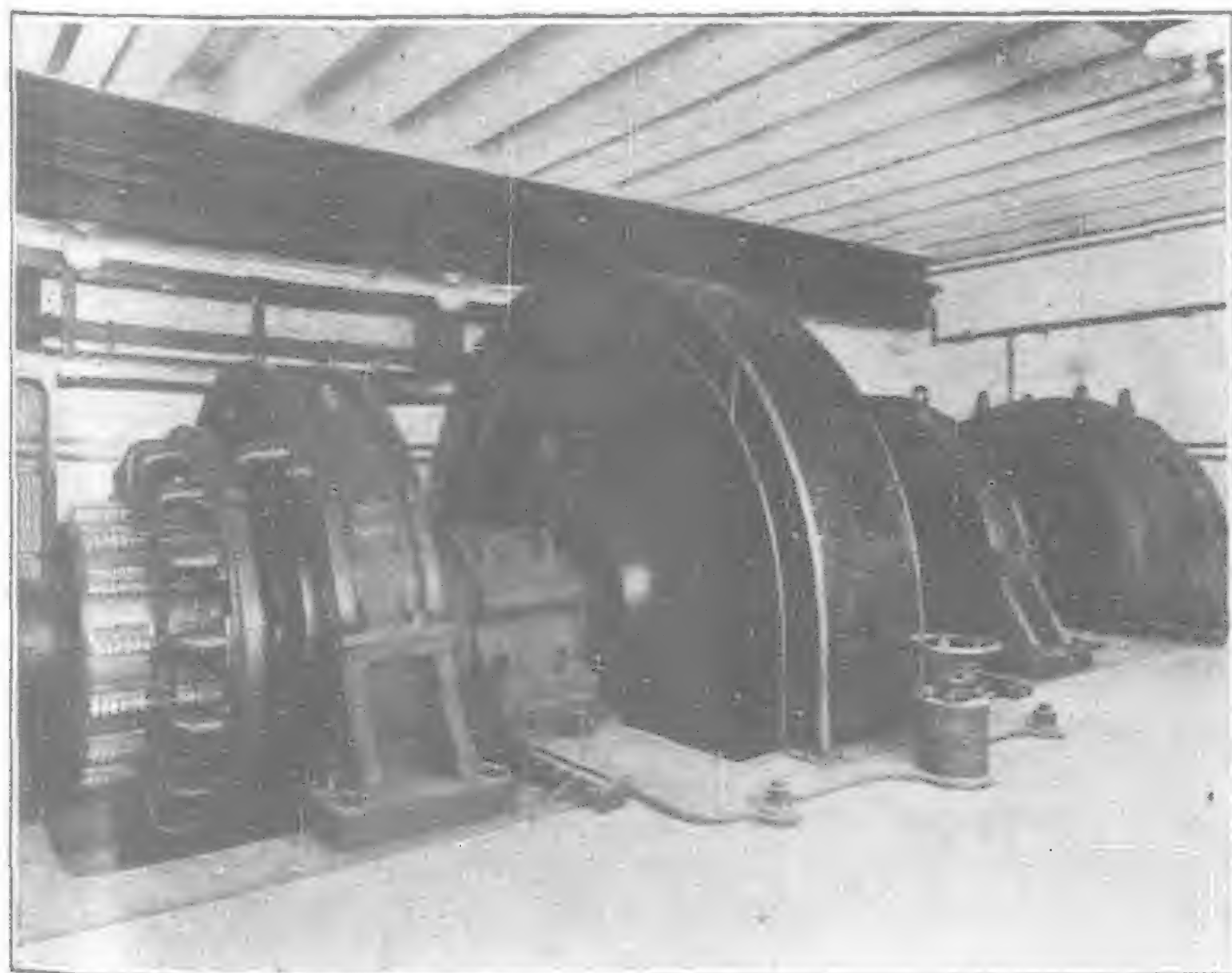


Fig. 2.—Showing a typical Flywheel Motor Generator Set—illustration by The English Electric Company, Limited

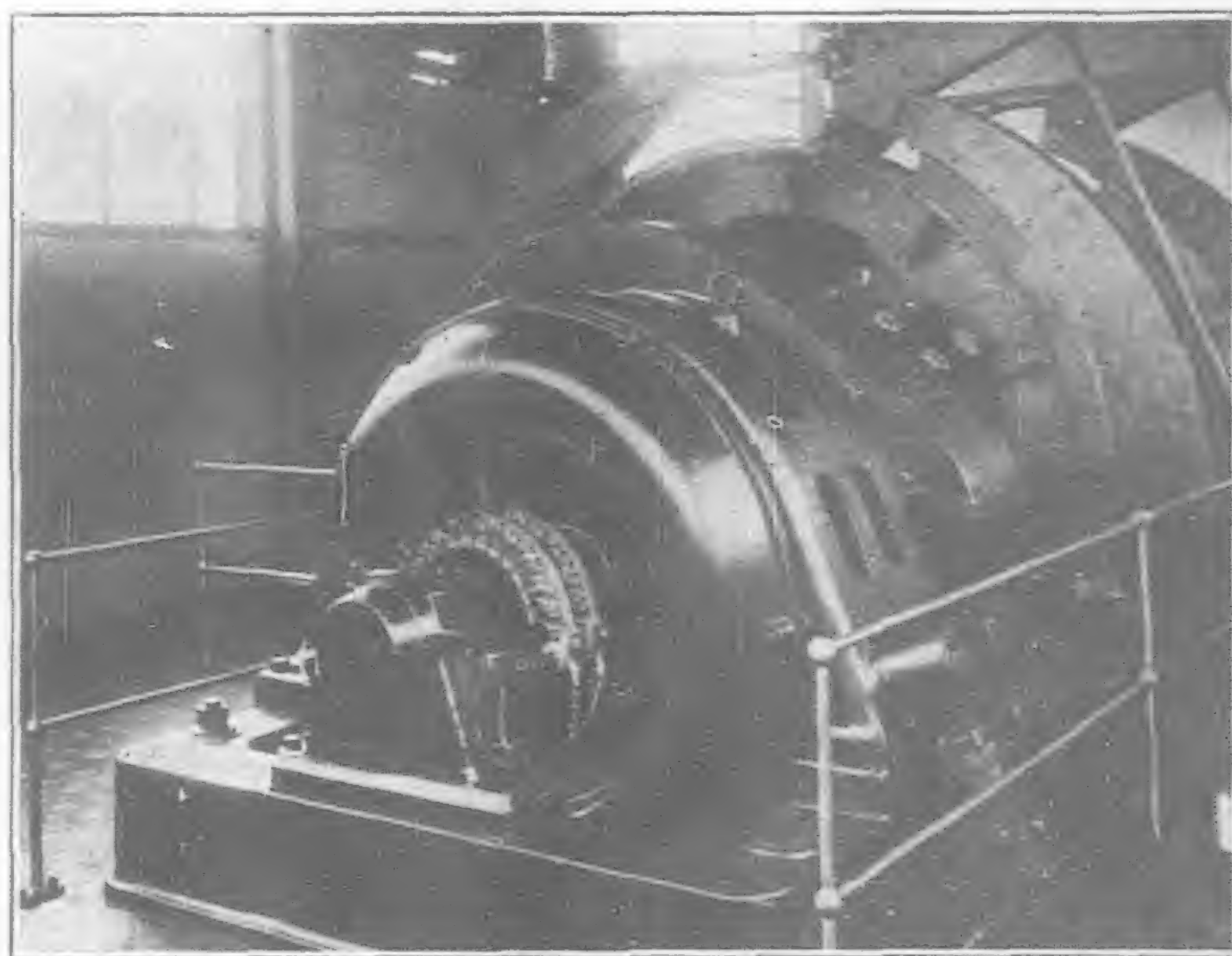
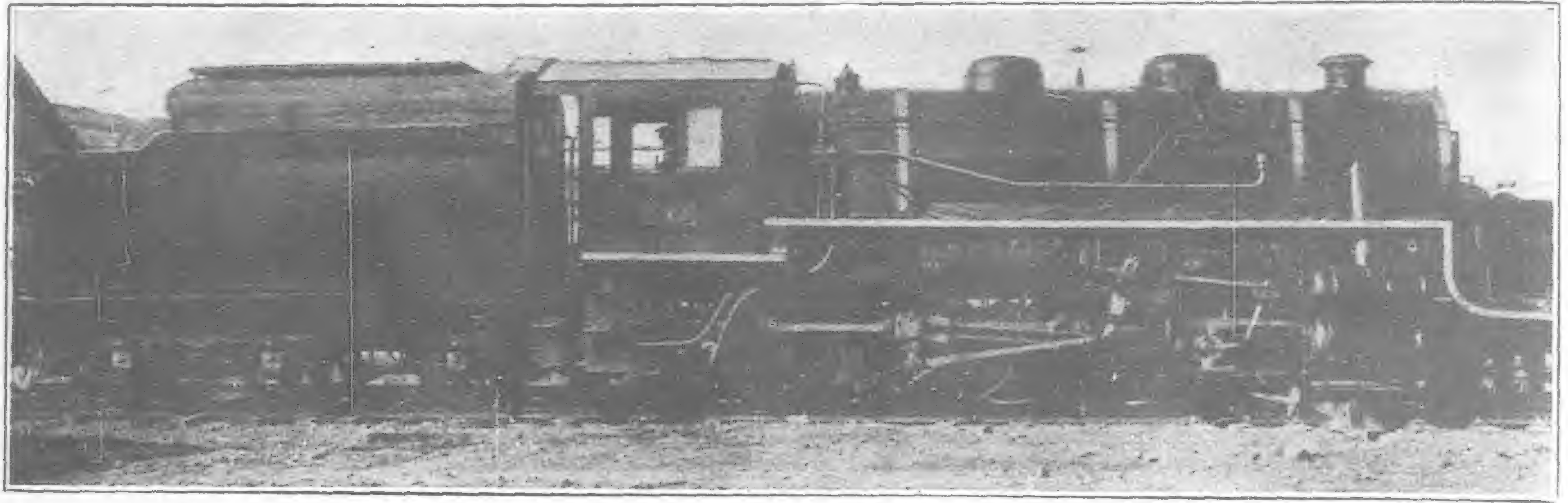


Fig. 3.—Showing type of Induction Motor for the Light Plate Mill and Chequer Mill—illustration by The English Electric Company, Limited





The First Locomotive in the Japanese Empire to Burn Pulverized Coal

## Pulverized Coal for Locomotives in Japan

**T**AIWAN (FORMOSA), the treasure island of Japan, which a few years ago was unexplored and inhabited by a fierce race of savage headhunters is now a progressive and prosperous country. The large tracts of virgin forest and mineral wealth have caused the name of Treasure Island to be bestowed upon it.

There are immense deposits of fairly good quality coal, but it has not been satisfactory for use on locomotive grates owing to its tendency to crumble, form clinkers and honeycomb on the flue sheets. These burning characteristics have prevented the use of anything but the best of the coal on locomotives. Native women sift the coal by hand, separating the lump from the screenings. The former is used for locomotives and the latter for small power plants and domestic purposes. Sifting has increased the cost of the coal.

Although the best of the lump coal is now used on the hand-fired locomotives, the results are not satisfactory from several standpoints. In the first place, the coal crumbles and falls through the grates. The method of firing found to be most satisfactory necessitates the use of two firemen. Their instructions are "fire light and often and keep the holes covered." The fireman has to close the door after each shovelful and uses a coal shovel which holds only two pounds. Although this careful method of firing prevents slugging and some waste of coal, it does not lessen greatly the seriousness of the fuel problem and it increases the labor cost.

Another disadvantage was the emission of cinders, sparks, and smoke from the stack. This not only represents a loss of fuel, but is objectionable from the standpoint of the passengers. This is particularly serious in Japan because of the numerous tunnels necessitated by the mountainous character of the country.

The Imperial Taiwan Railroad is progressive and had its engineers carry on extensive investigations in an effort to find some more efficient method of firing locomotives. The question of electrification was also taken up. Taiwan is very mountainous; in fact, it has the highest peak in the Japanese empire. There is plenty of rainfall and the well-preserved forests prevent floods and cause a reserve of water supply throughout the year. Consequently, it was thought that one hydro-electric power plant located at about the centre of the island could supply the whole island with more power than it needed. However, the high first

cost has eliminated this project for the present, or least until the screenings and low grades of coal have been utilized. The alternate plan was to find some method of burning the large amount of screenings and poor grade coal available. These investigations led to the consideration of burning this coal in pulverized form.

In the early part of 1921, three Lopulco equipments for locomotives and one complete set of equipment for the pulverizing plant were ordered from Mitsui Bussan Kaisha, Ltd., the foreign agents for the Combustion Engineering Corporation. The first locomotive was put into operation on October 15, 1922.

This locomotive was put in service between Taihoku and Keelung, a distance of 18 miles, over which the running time was 1 hr. 2 min., with six stops to switch out and pick up cars. Four round trips, or 144 miles a day, with switching at stops are considered a day's work over this division. Later the locomotive was put in service between Taihoku and Shinchiku, a distance of 45 miles. Here the running time is 2 hr. 45 min., with 12 stops to

switch out and pick up cars. Two round trips, or 180 miles, with switching at the stops are considered a day's work over this division.

After due trial, the pulverized fuel-equipped locomotive demonstrated that the screenings and low grades of coal could be efficiently used. As a direct result, two more Lopulco equipments were ordered by cable, and at the present time there are, either in operation or in the course of erection, seven locomotives in the Japanese empire equipped for burning pulverized coal—more than were ever used by the American railroads at any one time.

The locomotives operate on a track of 3-ft. 6-in. gauge and have a total weight of 133,900-lb., of which 117,400-lb. is on the drivers. The boilers carry a steam pressure of 180-lb. per sq. in. They have a total heating surface of 1,758 sq. ft., of which 345 sq. ft. is in the superheater, and there is a grate area of 33.9 sq. ft. The cylinders measure 20-in. by 24-in. and the drivers are 49-in. in diameter. The tenders have

a water capacity of 2,700 gals. and five tons of coal.

The coal now used on the hand-fired locomotives costs in American money \$6.65 a ton, while the screenings used on the pulverized fuel-fired locomotives costs \$4 a ton. This means a saving at the outset of 40 per cent. in the coal bill. In addition to this, a saving of 50 per cent. is made in the coal used in firing up, the standby losses are reduced to a minimum and there is a 15



Pulverizing Plant and Coaling Station at Taikoku, Formosa

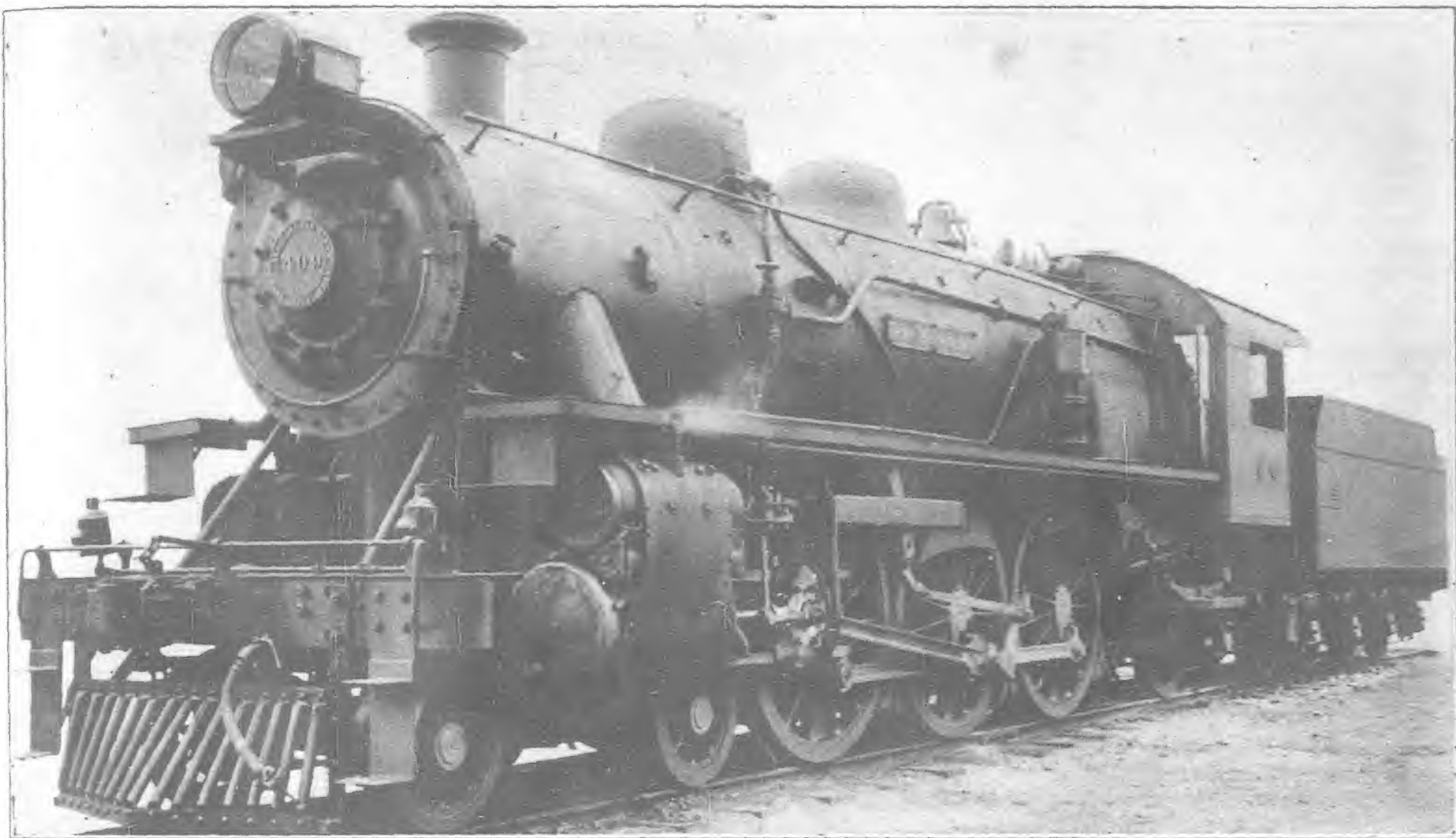


per cent. saving in coal burned when pulling the train. Another big saving is effected by the elimination of one fireman.

At present the hand-fired locomotives are coaled by coolies who carry the coal in baskets from the coal car to the tender. At first thought this might appear to be a very expensive method of handling the coal, but the wages of the men are about 8 sen (4 cents) an hour, so this is really not very expensive. When using pulverized coal, however, there is even a saving in this cheap labor

as only three men are required to dump the coal car and look after the pulverizing plant while there are about 16 men required to handle the coal for the hand-fired locomotives.

The illustrations show the type of locomotive on which the equipment has been installed, the methods used in coaling the hand-fired locomotives and the pulverizing and coaling plant installed at Taihoku, which is situated between the 18-mile and 45-mile operating districts.—*Railway Age-Gazette*.



New Locomotive for the Shantung Railway built at Osaka Works of the Kisha Seizo Kaisha, Ltd.

## New Locomotive for the Shantung Railway

**T**YPICAL of the development of the rolling stock industry in Japan is the growth of the Kisha Seizo Kabushiki Kaisha, one of the first private enterprises to enter the field in competition with foreign manufacturers for the supply of the domestic railway requirements. This company was organized in 1896 after the termination of the Sino-Japanese war, and has since specialized in the manufacture of locomotives. Foreign engineers who have inspected the works and its products frankly state that these not only compare favorably with locomotives made in Europe and

America, but in some particulars possess distinct advantages. Many of the finest and most powerful engines in operation on the imperial government railways have been turned out at the Osaka Works of this company. Recently this company built the standard gauge locomotive ordered by the Shantung railway administration and now are building six locomotives for the Chosen lines of the South Manchuria Railway.

In addition, passenger and freight cars of all types and sizes are manufactured for the domestic narrow gauge railways and electric tramways, while standard gauge cars have been built for the Korean and Manchurian lines. The shops are equipped to make cars for any gauge of line.

## Kowloon Tramways

**P**ARTICULARS of the new Kowloon tramway service given out by the Hongkong public works department provide for tenders for the running and maintaining of the following service:—

Commencing at the Star Ferry pier, the lines will run up Salisbury Road, then turn off along Nathan Road and Coronation Road, turning to the left up to Sham Shui Po; the length approximately 2.8 miles.

Another route will be on through Salisbury Road and Chatham Road to a point beyond the junction with Gascoigne Road, where the reservoir is; a distance approximately of 1.6 miles.

A third route will commence just before the mortuary on Coronation Road, and branch off to the right along a new road running up to the Kowloon Tong foothills (distance 1.6 miles.)

Route four will be along a new road at right angles to Coronation Road, from near its terminus, up to Kau Pai Shek (about 1.7 miles). A fifth route will be along Gascoigne Road, from Nathan to Chatham Road, approximately half a mile. The final route will run from the reservoir at Chatham Road along an extension of this road way up to Matau Wai village, about one mile in length.

The successful tenderer will pay the government an annual rent, being at least ten per cent. of the net revenue. The sum of \$50,000 will have to be deposited on the signing of the agreement. The construction is to be completed by December 31, 1925. The term will be for twenty-five years, determinable at the option of the government at the end of the fifteenth or twentieth year, on six months' notice. The company is to operate a system and type of car approved by government, who will provide all land required for the service.



# Railway Construction in N.E.I.

**D**UTCH Borneo is to have its first railway of the 3-ft. 6-in. gauge.

The Dutch government wanted to construct this railway, but the necessary funds were not forthcoming and they were finally obliged to let the Semarang-Joana Tramway Company have the concession.

The work was begun at the beginning of October 1921.

The railroad is only a short one, from Martapoera to Bandjermasin, 40 kilometres, but this will probably soon be followed by more. Bandjermasin which is reached from the sea on the Barito-river will then be connected by this railway with Martapoera, the centre of the native diamond-industry of Borneo and one of the richest parts of it.

A second railway may follow very soon as it is already studied and worked out, and in fact was much earlier under consideration than the one now begun. It is to connect the rich regions of Sambas on the west coast, *via* Singkawang, with the residency Pontianak, about 160 kilometres.

## Celebes

On this island railway-construction was begun already at the end of 1919, and the line from Makassar, the principal town in the south, going south to Takalar, 45 kilometres along the coast. All earthworks and bridges have been completed.

Plans for a railway from Makassar to the north are well under way.

It will be continued to Pare-Pare and then cross the mountains to the east coast to return eventually to Makassar in a loop.

## Sumatra

Sumatra is the only island of Netherlands India where railway-building is still going on. The communication of Telok Betong, in the extreme south, with Palembang on the east coast, about 400 kilometres, has been established making it possible to trip from Batavia to Palembang in nearly two days.

The crossing from Java to Sumatra by the boats of the Koninklijke Paketvaart Maatschappij (K.P.M.) is the difficult part, and as long as present conditions do not change, six hours must be taken for the 100 kilometres that are separating the two islands.

Another line of the government is built from Moeara Enim to Lahat by the Nederlandsche Maatschappij voor Havenwerken (Netherlands harbor works) that got its name through its working in China at Shanghai, and later on by the construction of the harbor of Chefoo.

But up till now the Netherlands harbor works have not yet obtained harbor-works in Netherlands India, and they built this railway of 40 kilometres, from Moeara Enim to Lahat for the government, with 400 Chinese and nearly 1,000 other coolies.

Here steam-shovels are for the first time being used in Insulinde. This line is to be continued from Palembang on the east coast, *via* Praboemoelih (where the line from the south will bring the passengers from Java in the future), *via* Moeara Enim and Lahat to Benkoelen on the west coast. But a much bigger railway plan will probably be executed before this cross-railway to Benkoelen, and this is the central railway from south to north of the island Sumatra, that will open up the richest parts of it.

In the north the Atjeh-tramway is already connected with the Deli-railway-system, this will be connected with the railway at Padang on the west coast, where the Ombilien and

other coal-fields are, and from there with the railways in the south at Lahat, where the locomotive from the south will arrive in 1923.

The communication between Java and Sumatra will probably be also of much importance for Singapore, as passengers will go by the quick route from Batavia to Palembang and from there to Singapore, saving quite a day on the present route.



Medan-Tandjong Balei Express, Sumatra

## Plans for the Electrification of the Railway Lines on the Dairen Wharves

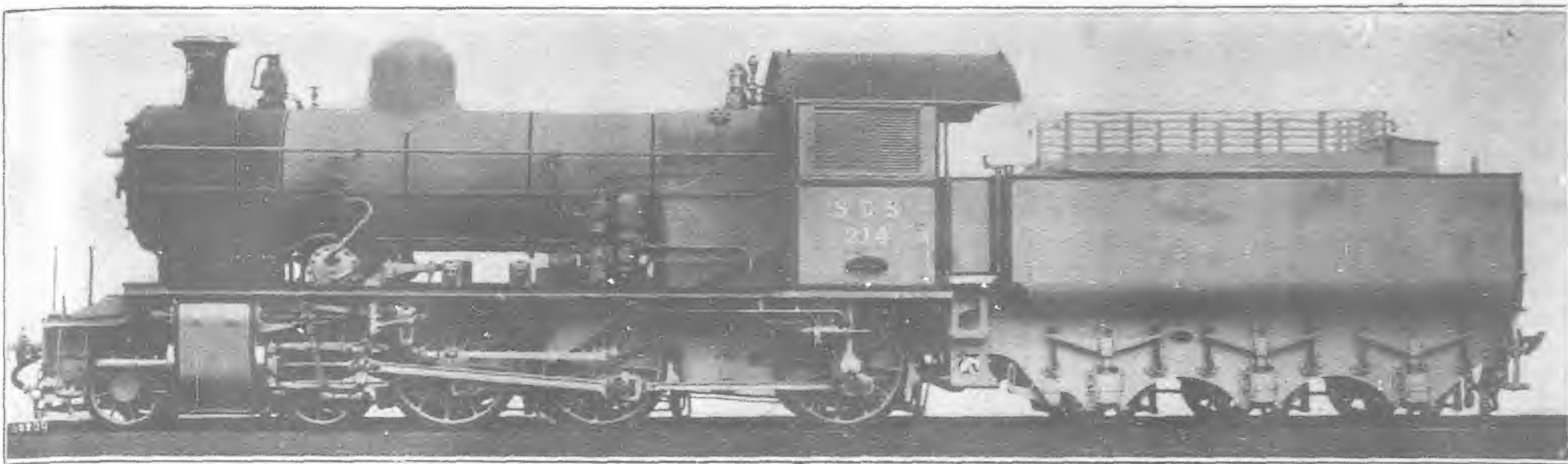
The South Manchuria Railway Co. is contemplating the electrification of the railway lines on the Dairen wharves, according to a report published in the *Ryoto Shimpō*. It has been ascertained that although this question has been discussed by the engineers of the company from the point of view of the great economy that would be effected—to say nothing of the abatement of the smoke nuisance—the discussion has not yet advanced to the stage of definite plans. There are about 45 miles of railway sidings on the wharves and 16 locomotives are employed in connection with cargo-shifting work at the wharves.

When the company reaches a decision in regard to the matter, even if no foreign aid is required for the work of installation, electric locomotives and material will have to be purchased from abroad. Manufacturers interested should send descriptive material, addressed to the director of the machinery division, South Manchuria Railway Co., Dairen. Very little business, however, can be expected to result from correspondence unless followed by personal appeal. It is, moreover, possible that a sales representative on the ground would be able to put the advantages of their equipment in such a light as to hasten the company's decision to act in the matter. The railway makes it a practice to buy material by inviting bids from firms having permanent offices here, and this fact might influence it to place the order with some Japanese firm which has offices in the United States or England as the case may be.



Railway Construction in Sumatra





Passenger engine built by Messrs. Beyer, Peacock & Co., Ltd., for the Samarang-Cheribon Tramway Company. Fitted with superheater and all improvements, these locomotives are used for the express train services connecting with the trains of the State Railway

## Tramways in Java

THE tramways in Java occupy a very distinctive place in the transport system of the Dutch East Indies. Not only in fact do they form in some districts the sole and very valuable means of local inter-communication, but their development has been of such a nature that they have come to fill an important place of their own in the wider sphere of through traffic facilities.

The first tramway concession dates back further than the earliest railway concession in the island. In 1867 in fact a concession was granted to certain private individuals for the construction and running of a tramway in the town of Batavia, on which animal motive power was to be employed. After heavy losses had been suffered this was converted in 1881 into a concession for a tramway with steam motive power, which, after being transferred to the Netherlands India Tramway Company, was developed into a financial success.

The first important application for a concession for the construction of tramways to run outside a town was that for a steam-tram in the district of Samarang, running from the town of Samarang to a place called Joana situated further eastwards, which application was submitted in the year 1880. In view of the proposed route and the existing plans to construct a state railway, running for the most part along the north coast of Java, from Batavia to Sourabaya via Samarang, the trace of which would therefore partly coincide with that of the projected tramway, the scheme gave rise to an extensive exchange of views regarding the matters of principle involved, which discussion finally led to a definite

postulation of the principles adopted by the authorities, and this statement has since continued to govern the attitude taken up by the government on many points relating to tramways.

The chief conclusions enunciated in this statement were that a railway implied the construction of an entirely new connecting road, for which, as a rule, a whole continuous stretch of land had to be expropriated for the exclusive use of the railway contractor, which was closed to ordinary traffic and was used solely for the transport of large bodies of people and large quantities of goods at a time at the greatest speed that could be attained with steam motive power. On the other hand, a steam tramway was usually to be regarded merely as an improved means of conveyance along an existing road. There was no need for the ordinary traffic along the road to be hindered, nor was it actually hindered in practice, since the trams run at a moderate speed only, and the engines were so constructed as to permit them to stop immediately. The steam-trams were not intended for the transport of large bodies of people and large quantities of goods at a time and at the greatest possible speed. The existence of a steam-tram, therefore, could not debar the construction of a railway.

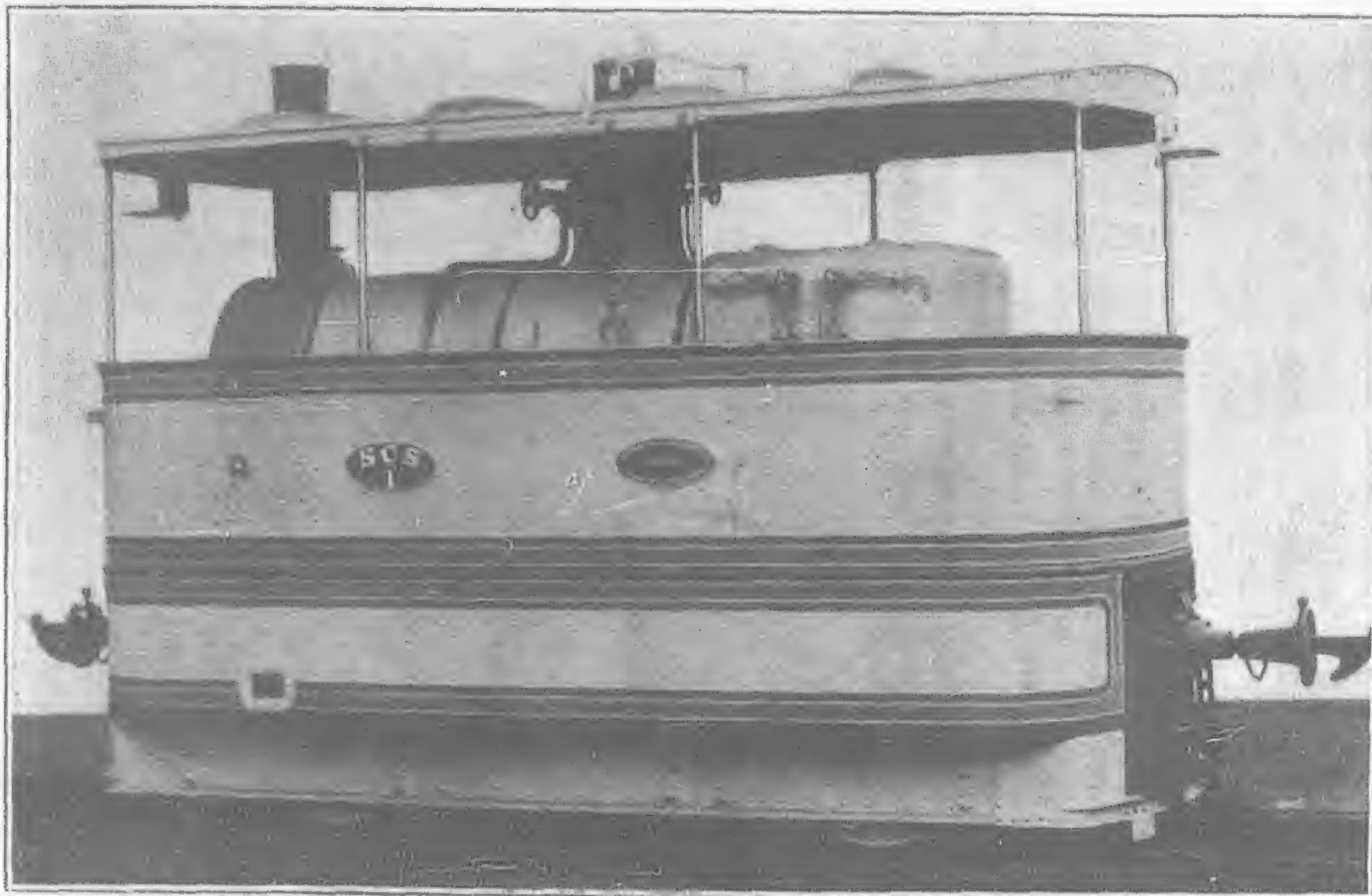
This clearly indicates that at first no such development of the tramways was anticipated as has since actually taken place. That the first tramways were considered to possess primarily a local importance is shown by the extent to which the head of the local district officers was entrusted in those days with the supervision of the tramways. This is also indicated by the concession conditions. The maximum speed was fixed at 15 kilometres per hour! As



0.5.0 four cylinder compound combined adhesive rack engine with superheater, Sumatra West Coast State Railways



## BEYER, PEACOCK LOCOMOTIVES ON JAVA TRAMWAYS



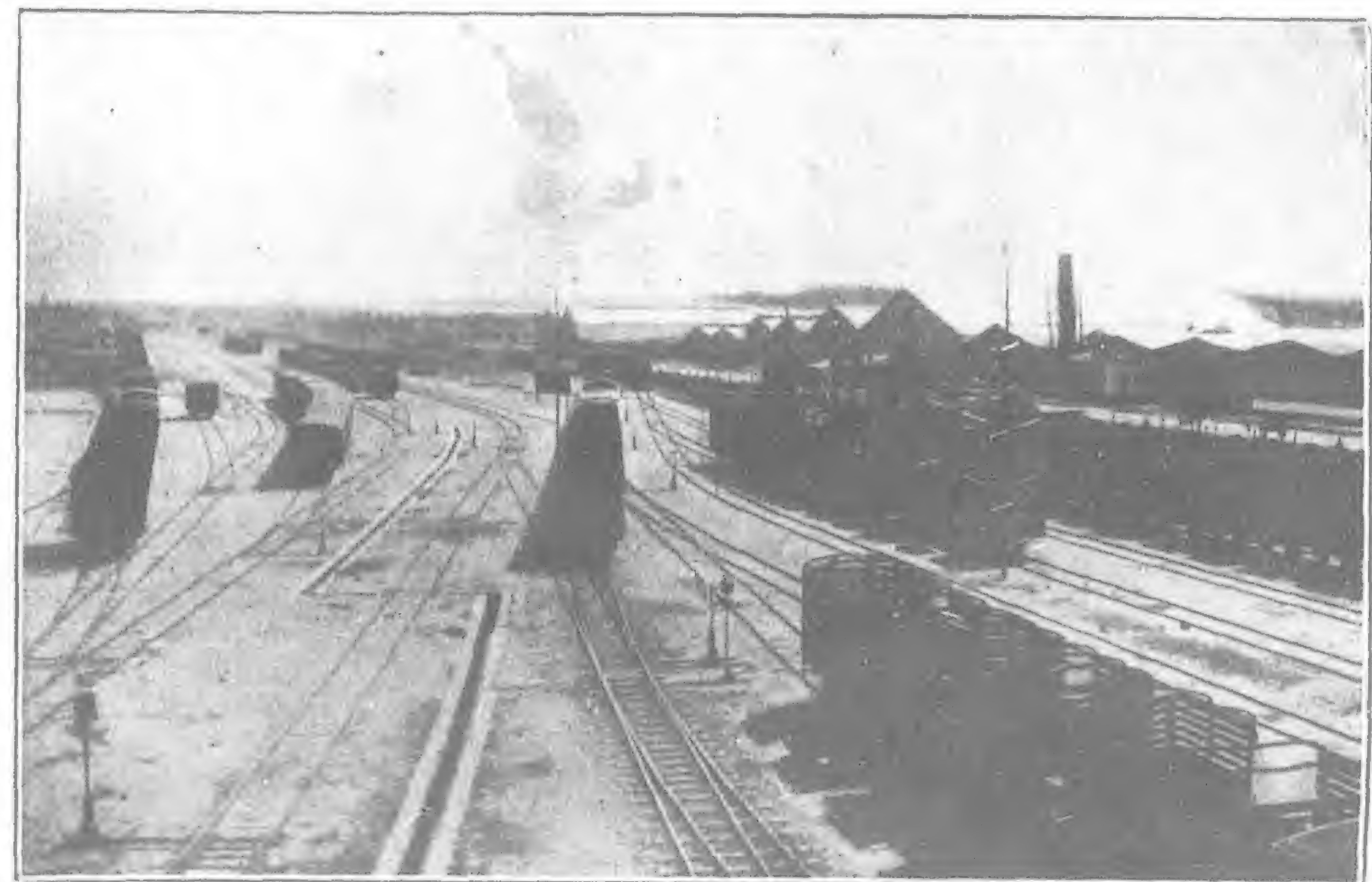
No. 8005. The capabilities of this engine are well known in Java, it being of the type used over the 384 kms. system of the Samarang-Cheribon Tramways, transporting goods and passengers at a speed restricted by statute to 45 kms. per hour



No. 097. Type of engine built for the Oost Java Tramway Company



Coal discharging yard at Tjilatjap Harbor (south Coast of Java)



General view of a portion of the new Harbor Yard at Kalimas, Soerabaja

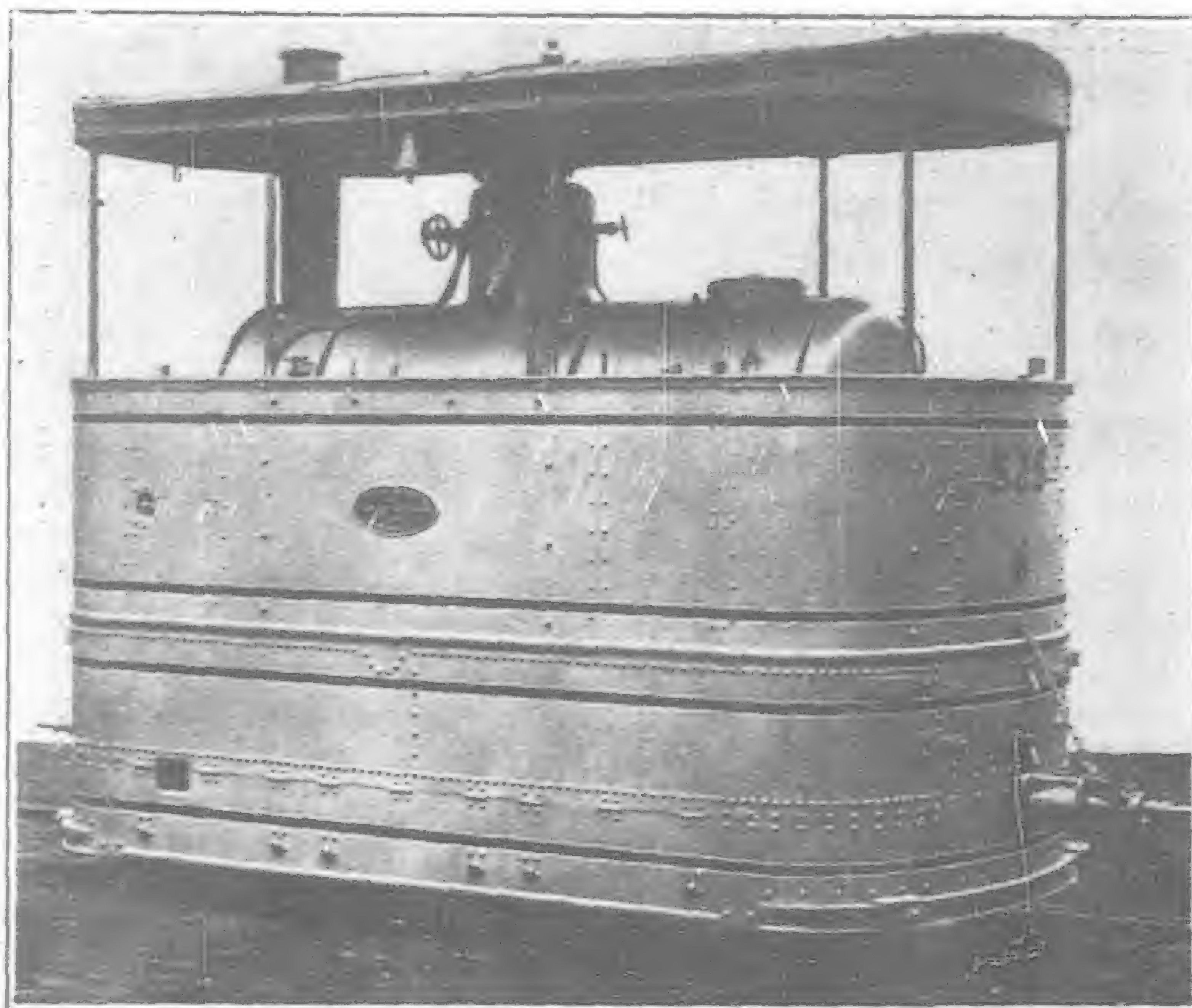


regards the tariffs the only stipulation was that they should be made public; the concession made no stipulation whatever regarding either an obligation to carry, or the right of expropriation; the length of the train was limited to 40 metres; nothing was stated regarding level crossings and junctions or running powers and working arrangements; obligations to undertake through traffic were non-existent.

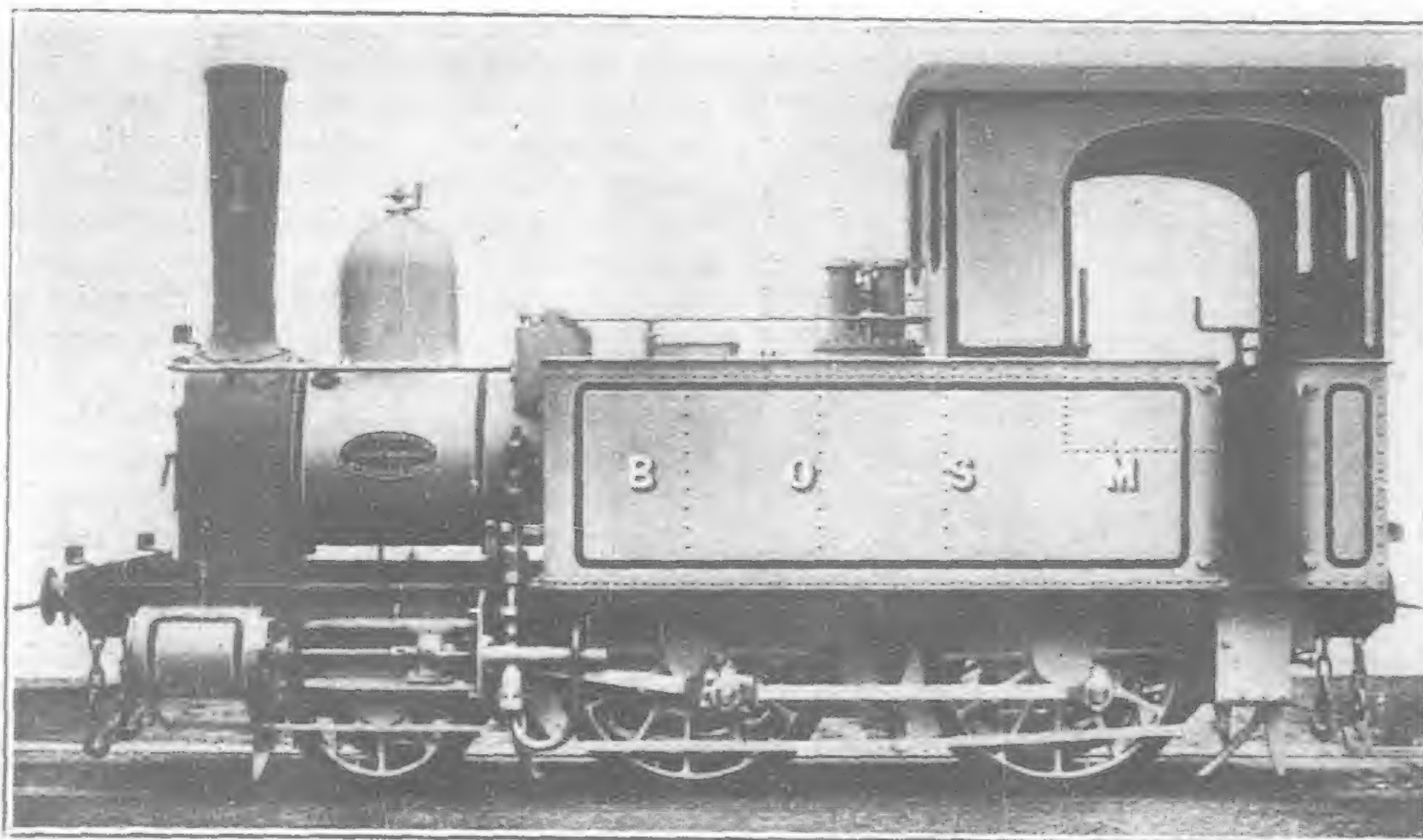
In the course of time, however, these conceptions became considerably modified; the tramways came to be regarded more and more as railways of local importance, which, however, carry traffic of great extent and frequently for very long distances. The legal regulations were also gradually modified in sympathy, the length of the trains allowed was considerably increased, the maximum speed was gradually raised to 30 and 40 kilometres per hour, the latter speed, however, only being permissible where the trams do not run along the public roadways.

In recent years traffic with a speed of 45 kilometres per hour even has been allowed on sections where there could be no objection on account of the situation of the line from the point of view of public safety; further the representation of a deputation of competent parties resulted in a prompter management of tramway affairs being instituted; the control on behalf of the government which was entrusted for many years to the chiefs of the local district authorities, is now placed in the same hands as the control of the railways; the right of expropriation is now stipulated in the case of all new tramway concessions. In the meantime the steady development of tramway traffic and the continuously growing importance it has acquired—whereby the interests of the public have become more and more closely affected—have naturally revealed to an increasing extent the desirability of bringing the regulations governing this traffic more into line with its present character.

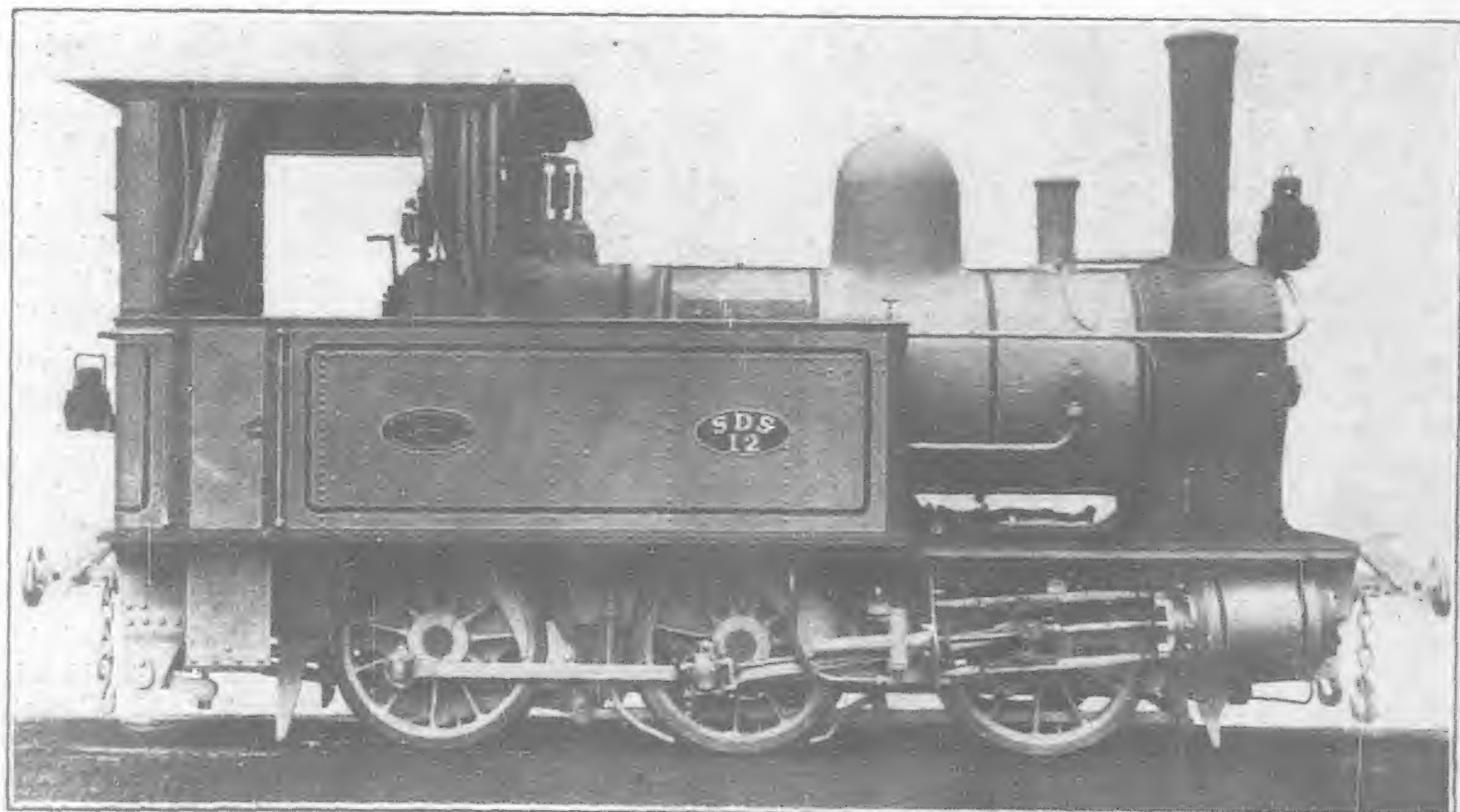
With that object in view a complete revision of the existing railway and tramway legislation has been taken in hand, regarding which it will be



No. 6167. Beyer, Peacock engine Built in 1882, still in use by the Samarang-Joana Steam Tramway Company



No. 6716. Beyer, Peacock engine used by the Batavia Ooster Railway for freight and passenger traffic



Type of Beyer, Peacock 0-6-0 locomotive used on the lines of the Serajoedal Steam Tramway Company in Java (3'6" gauge)

sufficient to state here that it is intended that the speed at which the traffic is run shall determine to which set of regulations a rail- or tramway is to be subject, a speed of 30 kilometres per hour making the dividing line between railways and tramways. Railways on which traffic is to be run at a speed of more than 45 kilometres per hour are classified among the original railways. The tramways are subdivided into two categories, the boundary line between which is a speed of 15 kilometres per hour. This subdivision according to speeds—which are naturally dependent on the extent of the traffic, and in connection with which, of course, the least elaborate regulations are designed to apply to the lowest speed—permits one to hope that further expansion of the transport system will be energetically proceeded with.

On the basis of the broad principles described above it has been possible for the tramways in Java to make rapid progress; they have been constructed for considerable distances, and indeed, as already mentioned above, they now play an important rôle in connection with the through traffic in the island. In the last few years particular activity has again been noticeable in this sphere; the construction of several new lines has been taken in hand—others



have gradually been compelled, owing to the extent to which they have grown, to join the ranks of railways, and have made a start with the requisite further constructional work involved.

The tramways in Java may be divided into three groups, viz.: (a) Actual town trams; (b) tramways of preponderatingly local importance, and (c) tramways on which through- and long-distance traffic plays a preponderating rôle.

Only some three tramway undertakings can be considered as falling under the category of actual town-trams, which term is here applied to trams in the larger cities connecting the business quarter with the residential suburbs and linking up the various suburbs with each other. Of these town tramways mention may be made in the first place of that in the town of Batavia, which besides linking up the town proper with the suburb Weltevreden, provides a connection with Meester-Cornelis, lying several kilometres more to the south. In 1922 there were 14 kilometres open to traffic. Up till now steam has been retained as the motive power, but plans have been prepared on the one hand to adopt electric traction, and on the other hand to extend the system by constructing a number of short lines.

As the second town tramway, which likewise runs within the township of Batavia, may be mentioned that belonging to the Batavia Electric Tramway. This also serves traffic from the town of Batavia proper to the outlying suburbs, but runs along an entirely different route to the steam tramway referred to above. This tramway system has been considerably extended during the last decade.

As the third town tramway is to be mentioned that of the East Java Steam Tramway Company, running through the town of Sourabaya to Sepandjang. As in the case of the tramways referred to above, this line is also only permitted to carry passenger traffic. Steam is used as the motive power; the dimensions, however, which the traffic has already attained, have induced the company in question to decide on using electricity as the motive power in future. At the same time a considerable extension of track has been taken in hand, involving the construction of a line partly encircling the town of Sourabaya, and also an extension of the track within the town itself.

In conclusion it will be of interest to mention that plans are also under consideration for constructing a system of electric tramways within the third chief town of Java—Samarang—and at the same time for electrifying the existing town portion of the line Samarang-Joana.

On investigating the tramways on which the traffic is of preponderating local importance, it will be found that these have developed most in the sugar-growing portion of East Java, where they serve to convey the products of the sugar factories either directly to a neighboring export shipping centre, or to the State Railway line for further transport to Sourabaya harbor. Several companies in that part of the island have in the course of time constructed a more or less extensive tramway system. Of these tramway lines and systems, many of which have spread in curious fashion corresponding with the situation of the sugar factories they serve, and which usually connect at various points with the State Railway system, that of the Kediri Steam Tramway Company, with a length of 123 kilometres, is the most extensive. The financial results realized on the tramways referred to here may be described as on the whole very favorable.

Several other tramways are met with elsewhere in Java of similar importance as feed lines for the State Railways. The sugar traffic is of primary importance also on a couple of these lines; the others carry a not inconsiderable passenger traffic besides transporting agricultural products, principally rice, for the native market. The revenue obtained from these lines also fully meets the expectations entertained at the time they were constructed. Some of these lines consist of ordinary railway track, and thus form a valuable portion of the general railway system.

One of the lines referred to here (from Babat to Jombang) though the area traversed by it displays a certain measure of prosperity, possesses special importance as forming a link between the main line of the State Railways and the parallel Gundi-Sourabaya line of the Netherlands India Railway Company.

Of the tramways of preponderating importance for through traffic, which, as already indicated above, owing to the nature and extent of the traffic subserved by them, have gradually acquired the importance of railways and are more or less run as such, mention

must be made in the first instance of the Samarang-Cheribon line belonging to the steamtram company of that name, and the Gundi-Sourabaya line of the Netherlands India Railway Company. Both lines, owing to the routes followed, are destined to play a predominating rôle in the transport traffic between Samarang and Batavia and Sourabaya, and between the two latter towns. The Samarang-Cheribon Steam Tramway, which has a length of 334 kilometres of track, provides a connection along the north coast of Java between the towns mentioned; along its route are lying the important coastal centres of Tegal and Pecalongan. The extent of the traffic, which was not inconsiderable even when the line was first opened, rendered this line a very remunerative undertaking. In 1912, as a result of the opening of the State Railway line between Tjikapek and Cheribon, that traffic further acquired the importance described above. A commencement had already been made before that time with the work of rendering the line suitable by means of lengthening the track and constructing short cuts, for considerably faster traffic than that for which it was originally constructed. By running a service of express trains (from January 1, 1913) connecting with the trains of the State Railways, it was rendered possible to reach Samarang from Batavia, and *vice versa*, along this line in the course of a single day.

The second line mentioned above (gauge 1.067 metre) connects at its terminus Gundi with the railway line Samarang-Vorstenlanden (gauge 1.435 metre), thus connecting Samarang with Sourabaya, although it is necessary to change trains at Gundi. The continuous increase in the traffic induced the company to apply for a concession to construct a new line from Gundi to Samarang to have the standard Netherlands Indian gauge of 1.067 metre. This connection was granted by the government. On the portion of the tramline already in existence the running speed has been increased since a conversion of the system of tramway administration into that of a railway has taken place some years ago. This could be effected all the more easily because the tramway runs for its whole length of 245 kilometres over the company's own track.

In addition to the two lines named there are several other tramways, especially in Central Java, belonging to various companies, which are of importance for through traffic. Mention may be made in this connection of the Samarang-Joana Steam Tramway, running from the former town eastwards in the direction of the coast, with a length of 395 kilometres, and connecting with the Gundi-Sourabaya line.

While the importance of the transport facilities provided by the various tramlines in Java varies a great deal in accordance with the nature of the traffic, there are also considerable differences in the nature of their construction. Most of the tramways have been constructed with the standard gauge of 1.067 metre (equivalent to 3-ft. 6-in.). On the whole it can be said that this gauge has served very well. Its applicability rendered it generally possible to keep the cost of construction proportionate to the extent of traffic to be dealt with. The movement that has been manifested several years ago for making use of a gauge of 0.60 metre may be attributed to a desire to let blessings of improved transport facilities be shared also by districts where only a very spare traffic may be looked for, without involving any heavy financial sacrifice.

While on the one hand the nature of the traffic carried, and on the other hand the character of the territory traversed by the various tramways in Java differ materially, the cost of construction of the lines has also varied considerably; the maximum cost is 201,000 guilders per kilometre and the minimum 19,557 guilders, while the average amounts to 64,700 guilders.

The weight of rails used on the various lines differs also considerably; on tramways having a gauge of 0.60 metre, rails weighing 12 kilos per metre have been utilized. Railweights of 16 and 20 kilos per metre have also been used, but on the whole preference has been given to the railweight formerly used on the main lines of the State Railways, i.e., 25.67 kilos per metre. It may be mentioned in this connection that rails weighing over 42 kilos per metre are in use on the reconstructed Gundi-Sourabaya line.

As regards the extent of the tramway systems in Java, at the end of 1921 there were 2,411 kilometres of tramway track open to traffic, as against 2,965 kilometres of railway; this fact is a convincing testimony to the great importance of the tramways. The capital sunk in the construction of the tramways amounted at that date to 155 million guilders, as against 427 million guilders invested in the railways.



The extent of the traffic on the various tramways, just as in the case of the railways, differs very considerably. The densest passenger traffic is met with, of course, on the town trams. Thus the number of passengers on the lines of the Netherlands Indian Tramway Company (14 kilometres) amounted in 1921 to 12.3 millions, on the lines of the Batavia Electric Tramway Company 7.6 millions, and on the town lines of the East Java Tramway Company (95 kilometres) 13.9 millions.

As regards the goods traffic, this is heaviest on the line of the Samarang-Cheribon Steam Tramway Company (381 kilometres), with a quantity of 1.1 million tons of goods for the year 1921, and on the line of the Samarang-Joana St. Tr. Co. with 0.6 million tons for the same year.

With regard to the total extent of the traffic and its development during the last few years, the following further particulars may be mentioned. The total number of passengers on all private tramways, which in 1912 amounted to 48.5 millions, and in 1917 to 67.0 millions, rose in 1921 to 84.0 millions, representing an increase within 10 years of nearly 80 per cent. The goods traffic showed an advance of from 3.4 million tons to 5.3 millions, or nearly 60 per cent. in the same decade. The total revenue from all private tramways increased during this period from 14 million guilders to 34.5 millions, or nearly 150 per cent.

These figures may be considered amply convincing evidence of the fact that the tramway systems in Java form a very valuable complement to the general scheme of transport facilities, and that as regards both the traffic they are capable of handling and the financial results already achieved, they give every ground for satisfaction.

On perusal of the above brief review, it will not have escaped the notice of the attentive reader that the course of development described above differs in many respects from what has taken place in other countries. The most conspicuous point of difference is the importance of the tramway system for general traffic, which approximates in several districts to that of the railways. This is to be explained quite logically by the special local circumstances. In the first place the familiar phenomenon which is met with in connection with most colonial enterprises, that money is only readily obtainable if the proposed employment of the capital promises to yield an especially favorable return, applies particularly to Java, where the shape and development of the country were of such a nature that no very large revenue was to be anticipated from railways.

As a result of this circumstance, but little private capital has been devoted to railway construction; what has been accomplished in this direction has been almost entirely the result of direct state intervention. The tramways, however, which were so much less costly, both to construct and to run, provided the means for attaining the desired co-operation of private capitals, and the inducement so provided has proved to be of a lasting and stable nature. In cases where the tramways have gradually developed their own traffic to such an extent that a railway may be considered likely to be a paying alternative proposition, the conversion into a railway can proceed on the spot without the proprietors being exposed to any serious risks. The transport facilities provided continue in this way to meet exactly the demand that is made of them.

## THE BRITISH EMPIRE EXHIBITION

(Continued from page 717)

per cent. are potential regular customers who will consume a pound of butter every week. Butter has been taken as an easy example, but the same principle applies to meat, fruit, dried fruit and canned fruit, and to some extent the same principle will apply to sugar, coffee, tea, rice, and a hundred other things drawn from every part of the world. Too much attention has been concentrated on the estimated consumption of these things at the exhibition. That is really negligible except for publicity purposes. It may reasonably be assumed that during 1924 there will be a predilection on the part of the British public to give preference to dominion products, but there is no use disguising the fact that there is an equal predilection on the part of any public to purchase products which are obtainable easily and at reasonably competitive prices. The exhibition would do more harm than good if the public, having learned to appreciate meat, dairy products, wine, fruit and tea from within the empire, found that they could not obtain these

products from their local sources of supply or could only obtain them at prohibitive prices.

When it comes to the investment of capital, the exhibition should bring prominently to the attention of British capitalists the attractions which the dominions offer for financial investment. The near future will certainly see a big expansion in the development of the natural resources of the overseas empire, and if British capital stands aloof, such development will be secured by means of capital from other sources. It may be true that finance is cosmopolitan, and that blood is thicker than water, but it is assuredly in the interests of a strong, united empire that British capital should continue to predominate in the economic development of the dominions and colonies.

Looked at, therefore, in its broadest aspect, the British empire exhibition means a great publicity campaign in which there are three equal partners—the dominions and colonies, the public, and the exhibition. The dominions and colonies have attractions to offer; it is their business to present those attractions in the most convincing form. It is the business of the exhibition to co-operate with them in every possible way in achieving their object. And, finally, it is the duty of the public to give everyone a fair run for his money. Let the public realize that on the one hand the dominions and colonies and on the other hand the exhibition authorities are striving to realize a great ideal. Its attainment rests very much in the hands of the public, who by helping the final purpose of the exhibition will be helping themselves, just because they are helping the whole empire.

## Clearing House for Scientific Research

There is one other aspect of the exhibition which must not be lost sight of. Scientific research is often termed, very inappropriately, a non-revenue producing section of an exhibition, when, as a matter of fact, the whole future of commerce and industry is bound up with research. Fortunately this axiom is appreciated in the dominions, and in certain directions, more especially relating to agriculture, the volume of support and the financial backing accorded to scientific research overseas are quite striking. There is needed, however, a clearing house for this work. Problems of stock and plant diseases are of common interest to the whole empire, and it would be a lamentable instance of lost opportunity if the British empire exhibition failed to give adequate attention to the results which have been achieved in different dominions—results which in too many cases are not sufficiently widely known. The original plans of the exhibition in this connection were on a very extensive scale, but there is some fear that financial considerations will prevent their being carried out. Surely within the empire there must be a sufficiency of public-spirited and wealthy men who will not allow this side of the exhibition purpose to languish.

Sometimes, in some quarters, there seems to be a disposition to regard the exhibition authorities as cockshies. No doubt, being human, they are open to criticism. But it cannot be too strongly urged that the exhibition itself is not a venture on the part of any group of individuals or of any particular party. It is a great imperial enterprise, designed to serve the interests of the whole empire by promoting mutual knowledge among all its components and by stimulating economic relations between them. So long as these main objects are kept in view the exhibition will, it may be hoped, play no unworthy part in helping to usher in the industrial and commercial renaissance which lies before the British commonwealth of nations.

## THE JAPANESE TRAGEDY

(Continued from page 712)

that when full reports come in it will develop that the earthquake itself did comparatively little damage, but that fire was responsible for the greatest loss, as was true in San Francisco in 1906, the tsunami greatly increasing the destruction at places near the shore. As the San Francisco earthquake originated along the San Andreas fault in the solid land, there was, of course, no disastrous sea wave connected with it.

Nor is there any reason for thinking that the Tokio earthquake was caused in any way by volcanic eruptions, which is in general popularly believed of all earthquakes, but which is in most cases an erroneous conception.



# The Japanese Tragedy

Views of Expert Seismologists on the Origin of the Earthquake  
From "The New York Times"

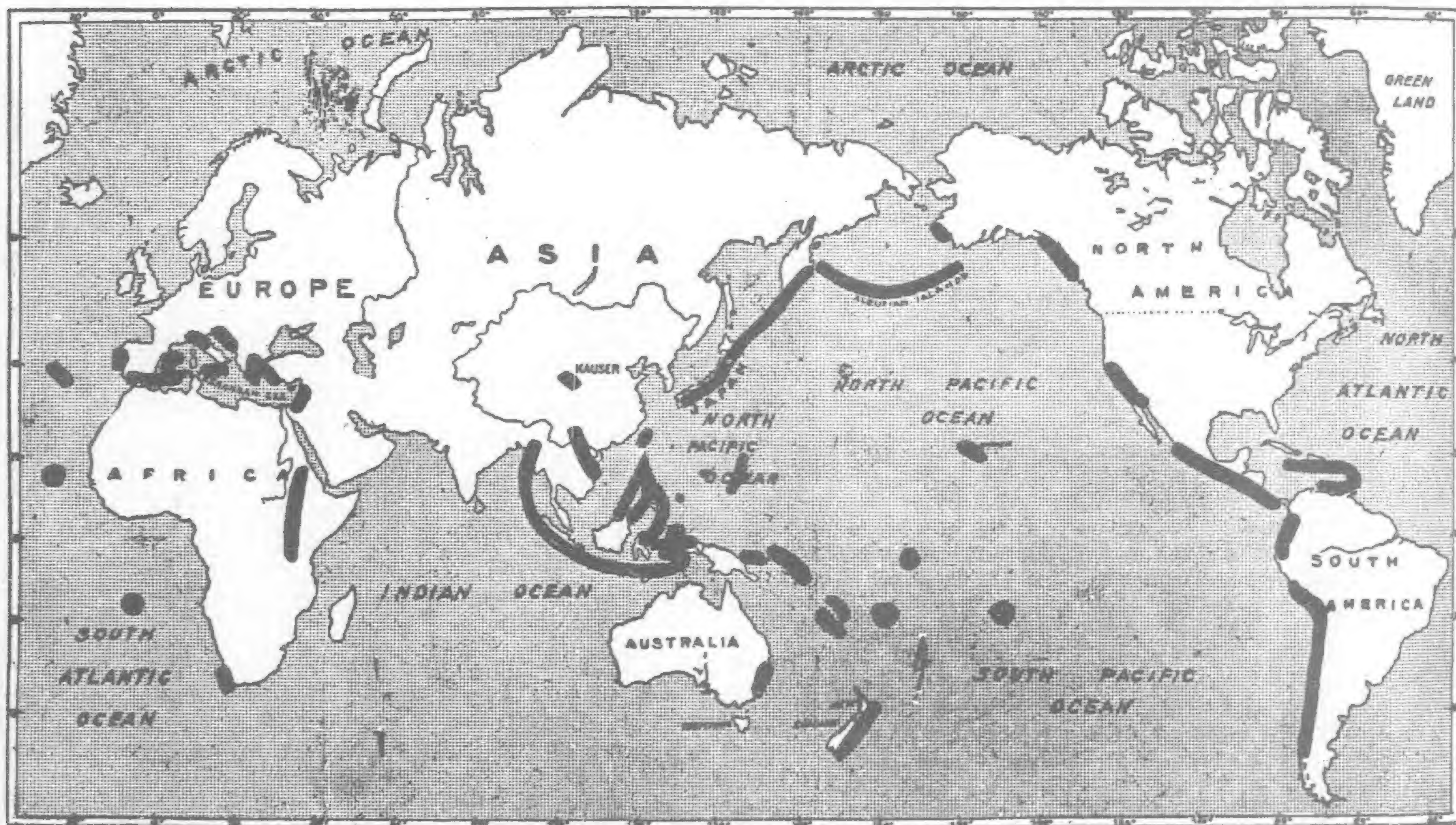
THE Japanese tragedy came as the spectacular culmination of disturbances that have rocked the Pacific since last November, spreading death along the South American coast and destruction throughout the storied isles of the South Seas.

Never in the known history of humanity has there been such widespread desolation as that visited upon Japan at one stroke. The classic tragedy of Pompeii in 79 A.D. seems slight compared to the fate of Tokio and Yokohama. Pompeii had a population of only 20,000 and the loss of life was about 2,000. In Herculaneum, destroyed at the same time, there probably was not more than a thousand dead. Tokio had more than 2,000,000 citizens and Yokohama in excess of 400,000.

centre about the middle of the earth, and those nearest the equator are much more active than the zones further away.

In describing the causes of the Japanese earthquake, Dr. Chester A. Reeds, seismograph expert at the American museum of natural history in New York, says, if we take a map of Japan and select a spot in the Pacific 1,000 miles distant, we find that the depth there is 4,206 metres, in 160 East longitude. Now let us travel to a point 250 miles from the coast. There the depth is 7,254 metres, something like five miles, one of the deepest spots in the world. In 160 East longitude, and extending both ways in a kind of arc, an undersea range runs for hundreds of miles. This is in a formative state, probably rising steadily nearer the surface, just as the islands which make up Japan rose in earlier times. They

## EARTHQUAKE ZONES THROUGHOUT THE WORLD



The Regions of Greatest Earthquake Movements Are Indicated by the Heavy Lines on the Map, Which Was Prepared by the Geological Bureau of the Department of the Interior. The Most Important of These Are the East Indies, the Pacific Basin and the Greco-Italian Region

As indicated by the accompanying map of earthquake zones, these disturbances generally are confined for the most part to well-defined areas. The map is based on a composite record of shocks over a period of years.

Now and for a long time to come the earthquake centres of the world, in the opinion of eminent seismologists, will be along the shores of the Pacific, in the region of the Aegean Islands, and Messina, Italy.

A study of earthquake zones indicates that most of them are confined to islands and coastal regions. Only occasionally do they extend inland any distance, which would seem to establish that the big masses of land away from the seacoasts are by far the safest. This may be understood on the theory that these inland masses are thicker and more solidified than along the edges or in the case of islands. It also is to be noted that the earthquake zones largely

are what we call new ground geologically, dating from the Tertiary Period, 1,000,000 to 3,000,000 years ago.

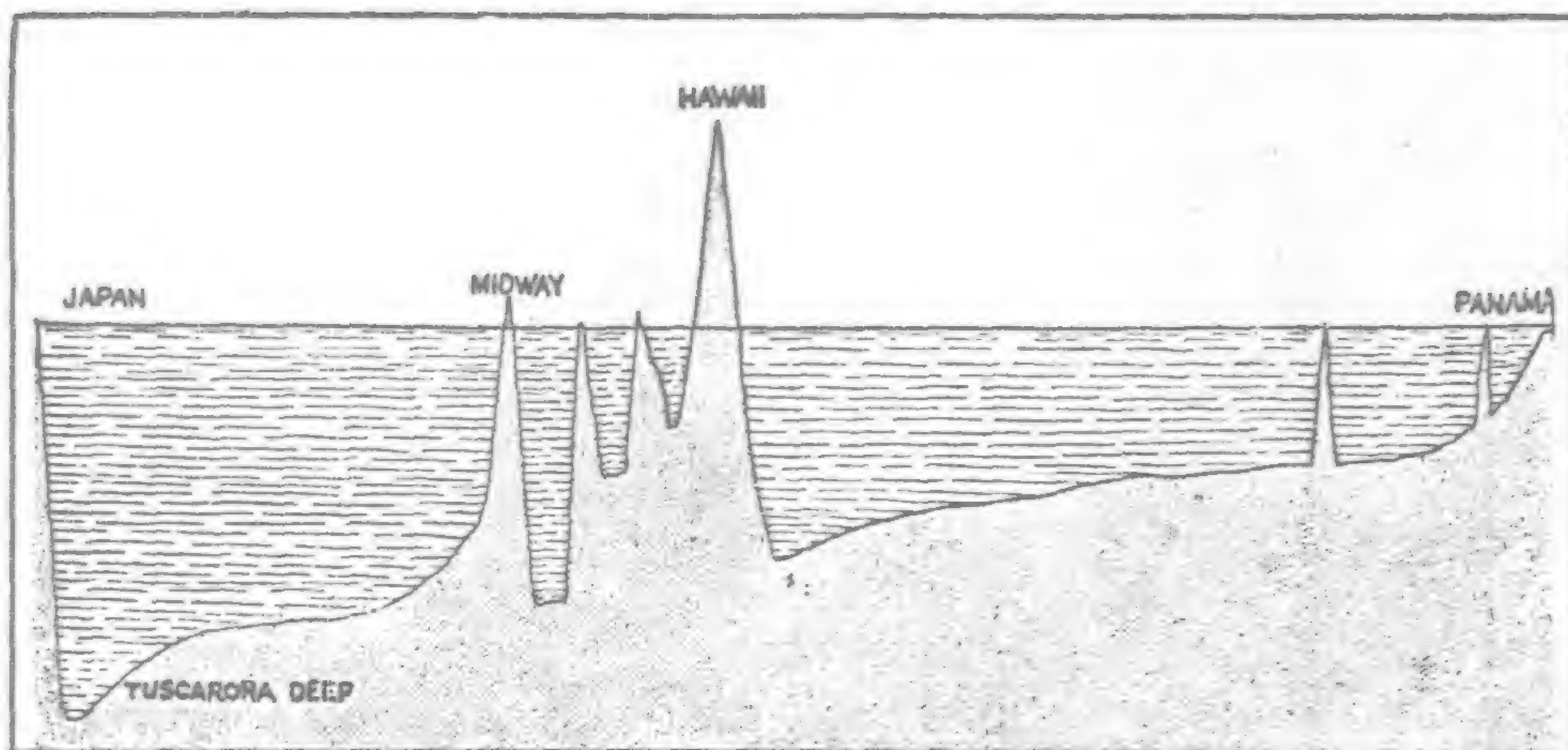
"Leaving the point 250 miles from the Japanese coast, the floor of the sea gradually slopes upward until it emerges in the crest of this second range, Mount Fujiyama, not far from Tokio, has a height of 3,780 metres, the highest point on the islands. Compare this with the depth of 7,254 metres 250 miles offshore and we get an idea of the tremendous difference in such a relatively small area. But 1,000 miles out to sea there is that second range, 4,206 metres. Nature has a way of matching one mass against another, particularly in the case of mountain ranges, and these exert pressure upon each other. The undersea range has that relation to Japan and there also is a difference in the gravity. Well, this pressure is the immediate cause of the shocks, as one mass is adjusted to the other. How long that process will go on nobody can say, and neither is



there any way of predicting in which direction it will next crop out. But, broadly speaking, the danger points are in the known earthquake zones. And in the case of severe disturbances it is not unusual for these to be repeated under intervals of at least ten or twenty years."

The Rev. Father Francis A. Tondorf, director of the Georgetown University Seismic Observatory, says that the maps of zones along which earthquakes are liable to occur are quite

as dependable as any of our geographical maps of the world. An inspection of such maps shows that the most earthquake-shaken regions of the globe mark the boundaries of the Pacific Ocean. They likewise show that many, if not the greater number, of quakes have their origin in the ocean's bed. Study these maps and one would naturally wonder if the coastal distribution of earth movements paralleled a like volcanic distribution along the Pacific border. Modern seismology indicates that the greater number of earth shocks are dependent upon fractures in the earth's crust, fractures that are either new or displaced upon those already existing.



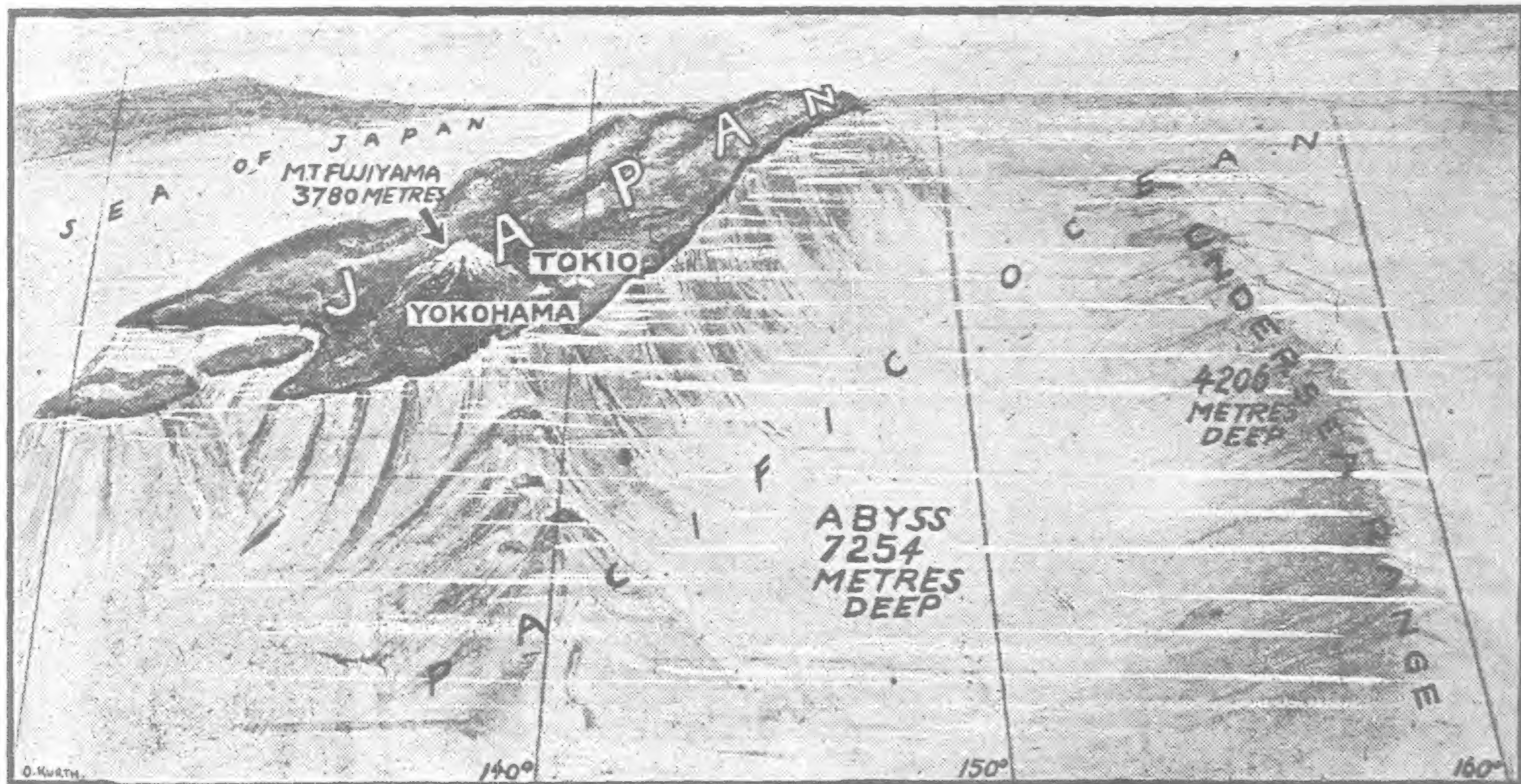
From the New York "Times"

Profile of the Ocean-bed from Panama to Japan

What might these causes be? Necessarily, some stress or stresses, in excess of the resistive strength of the rock, at the line of weakness. Just as a bar of steel at any point, because of a flaw in the steel, will only break at the point of weakness when pressure greater than the resisting power at the point of weakness, is applied, so with the earth's crust. Such stresses are brought about by displacement of the abutting portions of the rock.

Dr. Omori, a member of Japan's imperial earthquake investigation committee, suggests as a contributing cause for the stresses in Japan the heavy precipitations in the northwest portion of the island, and likewise suggests that variations in the barometric pressure, the weight of the atmosphere, is no negligible factor. This latter assertion will appeal the more to us when we recall that a variation of one inch in the mercury column, which is not an unlikely condition, means a change of pressure of one-half pound per square inch, or 3 1-3 per cent. of the total atmospheric pressure. From instrumental observation, it has been ascertained that the

## FLOOR OF PACIFIC WHERE DISASTER ORIGINATED



Between the Coast of Japan and the Submerged Mountains in the Foreground, 1,000 Miles Distant, Lies the Tuscarora Deep, an Abyss Nearly Five Miles to the Bottom. It Was in This Abyss That the Disturbances Arose Which Caused the Earthquake

It is not hard to associate the notion of weakness with these fractures, and so it readily might be said that earthquakes are caused by slippings along these seams of weakness, such slippings being known to the geologists as faults.

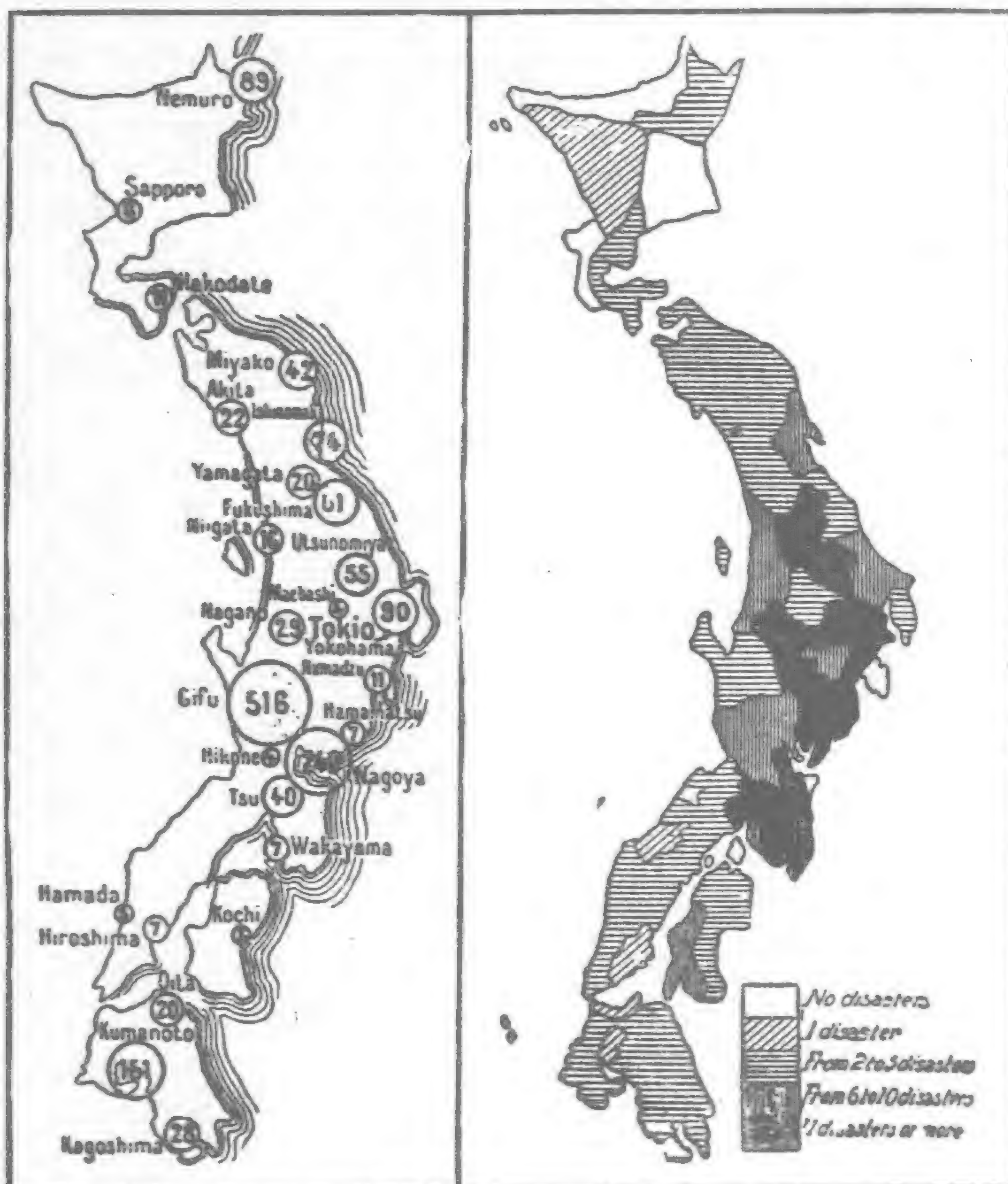
"Dr. Nauman, in 1850, first suggested the name "tectonic," by which such quakes are now known, and it is therefore evident that these seams of weakness as the causes of the quakes, for without this weakness no earthquake would be likely. But, admitting such lines of weakness, no fracture could obtain without contributing causes.

passage of a cyclonic storm has occasioned a measurable titling of the earth.

As an example of slips which occur along fault lines, it might be mentioned that there occurred thirty-two years ago along an old fault plane in Japan a slip which produced an earth rent for sixty miles, with a twenty-foot repression of the land on one side and on the other a horizontal shift of thirteen feet in the direction of the fault.

It is, of course, quite reasonable to expect that such a shift will be accompanied by a tremendous output of energy. We can





From L'Illustration (Paris)

AVERAGE ANNUAL SHOCKS      GREAT DISASTERS SINCE FIFTH CENTURY

#### JAPAN'S EARTHQUAKE RECORD

The left-hand map shows the average annual number of earthquake shocks in Japan in different districts, and on the east coast, the relative frequency of tidal waves (indicated by wavy lines of shading). The right-hand map shows (by shading of graduated intensity, according to the table at the foot) the comparative incidence of seismic disasters in various parts since the fifth century, based on "Seismological Geography," by Montessus de Ballore.

appreciate this fact when it is recalled that Mendenhall calculated that the energy expended in the Charleston, S. C., earthquake of August 31, 1886, was 1,300,000,000 horsepower, and that was mild when compared to the great Japanese shocks of last week.

Dr. Henry S. Washington, of the Carnegie Institution, says that the recent earthquake which brought devastation upon Japan and which appears to have been one of the most destructive that ever happened, even in that land of earthquakes, naturally arouses curiosity as to the cause or causes that brought it about. It is too early, as yet, before more than the most meagre details are known, to discuss these at all adequately; but it may be of interest to explain briefly what appear to be the causes of the quake and its probable place of origin, judging from what is known of Japanese earthquakes in the past and what few details have come to us.

To obtain a just idea of the cause one must have some idea of the general structure of the east coast of Asia and of the sea floor of the Western Pacific Ocean. The Japanese islands form one of a series of island "festoons" that fringe the Asiatic continent. The first "festoon" is the Aleutian Islands, followed by that of Kamchatka and the Kuriles, then the Japanese islands, followed by the Riu Kiu Islands, which run into the Philippine festoon, and thence into the transverse festoon of the Dutch East Indies—Sumatra, Java, etc.

Outside of these festoons and not far from them are long narrow troughs in the sea floor, like deep narrow valleys on the land, which run parallel to the trend of the island groups. The deepest portion of these troughs, in which the bottom is more than 3,000 fathoms (about three miles and a half) below the surface, are known as "deeps." That which is nearest to Japan, from 100 to 250 miles away, is known as the Tuscarora deep, and was discovered by the United States warship *Tuscarora* in 1874. This extends from the Tropic of Cancer to the Aleutian Islands, has an area of about 900,000 square miles, and a maximum depth of about 4,600 fathoms,

or more than five miles, with very steep sides. The *Tuscarora*, however, is not the deepest "deep," others being known in the Pacific in which soundings exceeding 5,000 fathoms, or about six miles, have been obtained.

This structure of fringing island festoons and apparently related "deeps" is supposed by most geologists to be caused by wrinkling of the crust during the slow cooling and contraction of the globe, the "deeps" being the downward and the island festoons the upward parts of the combined fold. That this wrinkling movement is still in progress in the Japanese area is evident by many observations in Japan, such as becoming shallow harbors, posts at which fishermen formerly tied their boats being now hundreds of yards inland, and many other such facts. These show that the eastern coast of Japan, and especially of the main island Hondo, is gradually rising, while parts of the western coast are sinking.

Thus the Japanese islands are slowly tilting toward the West. This tilting movement is caused apparently by a thrust or pressure from the ocean side, although the exact cause is somewhat obscure. It may be said, incidentally, that a Dutch geologist has found evidence to show that such a thrust exists and to such an extent that it appears that the islands of the Dutch East Indies—Sumatra and Java—with others, are being gradually shoved back on themselves away from the ocean. As the *Tuscarora* deep forms an integral part of the Japanese wrinkle, this "deep" must be continuously getting deeper and probably narrower, as we may judge from similarly formed but much more ancient folds in the crust that have been exposed to our study by the erosion of old land surfaces. Also, it is practically certain, again to judge from such analogous occurrences, that the bottom of the narrow trench is cracked.

In accordance with what is known elsewhere of such crystal movements, this continuous pressure which produces the wrinkling also will "accumulate stress," as the phrase is, until something has to give way somewhere. The accumulated pressure is thus relieved by slipping along the fault-crack or system of cracks. As one consequence of this the sides, which are, of course, very rough and irregular, rub together and set up vibrations in the solid rocks of the crust, which are propagated in all directions and form the earthquake. If we may judge from what little is known of the Tokio earthquake, the recent slip must have been one of great magnitude, both in length and depth.

At the same time that these vibrations are being set up in the solid crust, the sudden slipping (which is generally downward on the side of the crack) of part of the ocean bed, imparts motion to the overlying mass of water. At the surface this takes the form of a wave which sweeps forward with ever increasing height as it passes over the gradually shoaling water near the land, until its height becomes 50, 60 or more feet when it strikes the shore. Thus originate the gigantic sea-waves or "tsunami," as the Japanese call them, which have done so much damage in many earthquakes on both sides of the Pacific as well as, but less often, of the Atlantic.

Such, in brief, is what is supposed to be the cause of the Japanese disaster—mechanically a very simple cause; perhaps to many persons apparently too simple to account for such tremendous effects. Many examples might be given of similar earthquakes, similarly caused and accompanied by disastrous *tsunami*—such as that of Lisbon, in 1755, when 60,000 persons perished, or that of Arica, Peru, in 1868, when the United States steamship *Wateree* was carried half a mile inland.

Tsunami do not accompany all seaquakes, but they are frequent and sometimes occur when no serious earthquake is felt. That the down-slip is sudden and rapid is shown by the wave that is generated and its size, inasmuch as no sensible wave would be produced if the movement of the bottom were slow. It may be pointed out, by the way, that the term "tidal wave" for these tsunami is a misnomer, as they have nothing to do with the tides, the true tidal wave being of a different character.

There is no ground for the belief that in this recent earthquake there was any "leakage" of sea-water through the cracks or the solid crust into the "hot lava beneath." This appears to have happened in very deep water occasionally but, so far as known, the effects of such an event differ in several respects from what little is known of the Tokio earthquake. This appears to have been of the most frequent type of Japanese earthquake, and it is probable

(Continued on page 709)

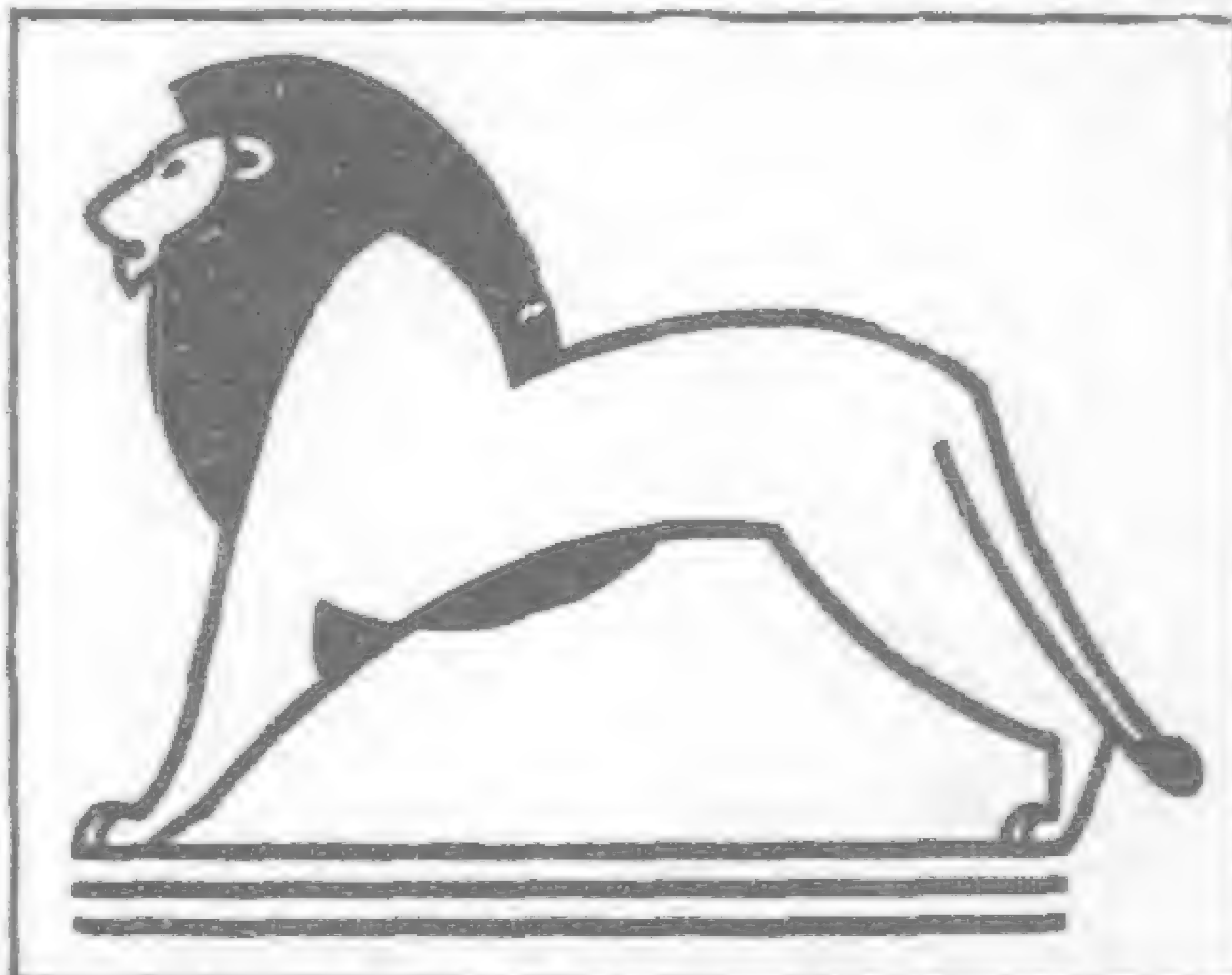


# The British Empire Exhibition (1924)

By Major E. A. Belcher, C.B.E.

The writer of the following article was the head of the British Delegation which visited the Dominions last year to enlist their support for the great Imperial Exhibition which is to be opened at Wembley next year. He is the Assistant General Manager of the Exhibition, and writes with intimate knowledge of what is being done and planned.

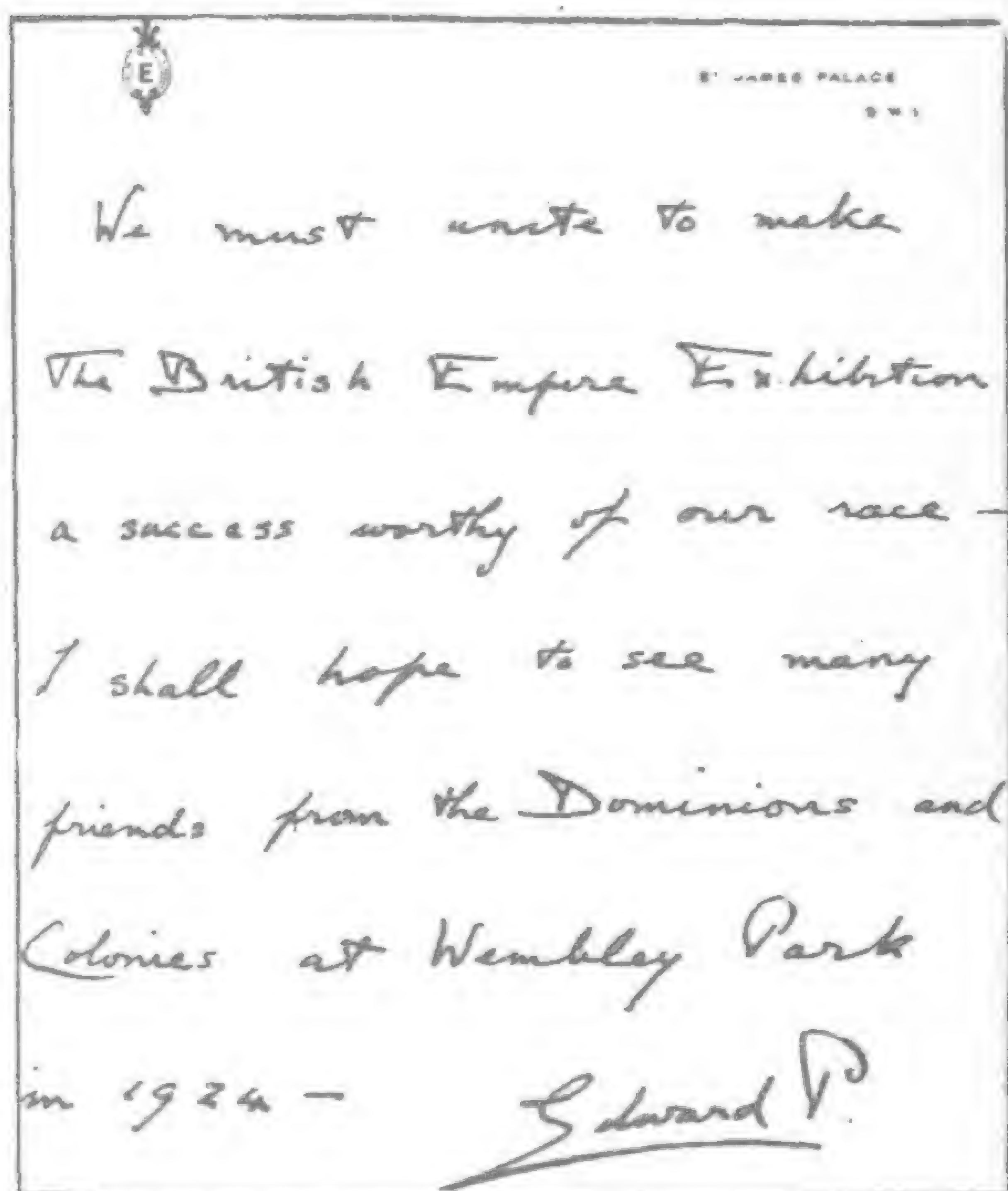
**W**HEN Offa, king of Mercia, paid his traditional visit to the Eternal City, the great *Amphitheatrum Flavium* completed by the Emperor Titus in A.D. 80 had for seven centuries remained an abiding memorial of the greatest days of the Roman empire. Offa's kingdom stretched from the Brent to the Trent, and Wembley Park—so called after an ancient British tribe, "The Men of the Meadow"—lay at the extreme south-eastern end of Mercia. Wembley Hill occupies a commanding position in the valley of the Brent, and it is no great stretch of imagination to think of Offa, already designated by Charles the Great as *Rex Anglorum*, wandering over the very spot where twelve centuries later the achievements of a greater empire than even he, as one of its progenitors, could dream of were to be enshrined in a great imperial exhibition.



before the war, and that since the war the Prince of Wales has galvanised it into life, not only by his appeal to British industry and commerce, but equally by his steady and practical interest in every stage of its development. In that respect the Prince of Wales is following in the footsteps of his great-grandfather, with whom the great exhibition of 1851 will always be specially associated. There is a long list of others, at home and overseas, who have borne, are bearing or will bear some share in the great enterprise. It is not, for example, generally known that at a critical stage in the negotiations for the purchase of Wembley Park, when the executive council had more faith than money, Mr. Fred Hiam, the well-known East Anglian agriculturist, paid the deposit of £6,000 on the purchase price to seal the bargain, or that the council of the football association—and especially that doyen of football officials, Mr. F. J. Wall—at a time when everyone else was casting ridicule on the plans for an empire stadium, had the courage to enter into serious negotiations to occupy a building which did not exist on a piece of land which had not been purchased. The original freehold area purchased was 120 acres. Since then, owing to the expansion of the exhibition and particularly to the very large participation of the overseas dominions, an additional area of 106 acres has been acquired on lease.

## The Stadium

The first million of the guarantee fund was completed on January 3rd, 1922. Seventy-two hours later the Duke of York turned the first turf in the centre of what is now the royal archway into the stadium, and so inaugurated the building of the exhibition. An inscription carved on the side of the archway commemorates this fact. The stadium is the first portion of the exhibition buildings to be completed. Its construction was specially expedited in order that the structure might be available for the 1923 cup final, and the actual building operations occupied 306 days. As the capacity of the stadium is approximately twice that of the Roman colosseum and three times that of the stadium at Athens, its completion in less than twelve months is a very remarkable achievement. Before any construction was started, the levelling of the site demanded the removal of about 120,000 cubic yards of yellow clay from the west end, most of which was required for filling-in purposes. The interior of the stadium provides an oblong of grass, nearly 500-ft. long and 260-ft. broad. Surrounding the grass is a cinder track precisely 440-yds. round, and by the ingenious use of a tunnel at the west end a perfectly straight 220-yds. has been



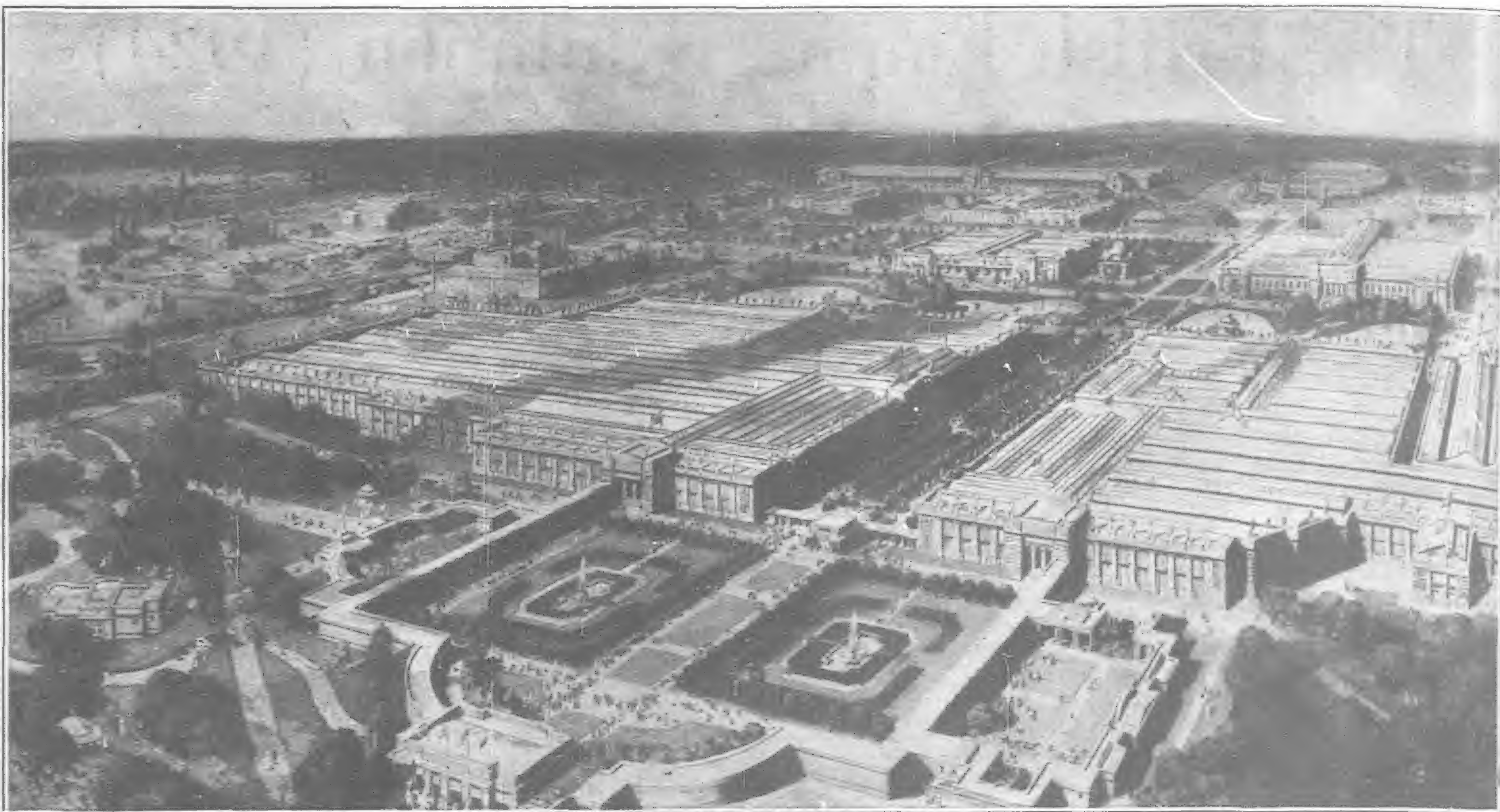
Facsimile of Prince of Wales letter to the Exhibition Authorities

At the coming of the Friars in the thirteenth century, Wembley Park became the home of a religious foundation—a daughter convent to Kilburn Priory; and at the dissolution of the monasteries this home became an old English manor, known as the White House, which remained in the hands of the same family for over 200 years, till the close of the eighteenth century. The house itself stood on the site of the present stadium, and from there stretching down to the chain of lakes which will be the central feature of the exhibition was a famous old English garden, the glories of which will be revived almost precisely on the same spot.

Some day the full story of the exhibition will be told. It is not without romantic interest. Everyone knows that the late Lord Strathcona conceived the idea of a great empire exhibition

H.R.H. THE PRINCE OF WALES,  
President of the Exhibition





General View of Exhibition

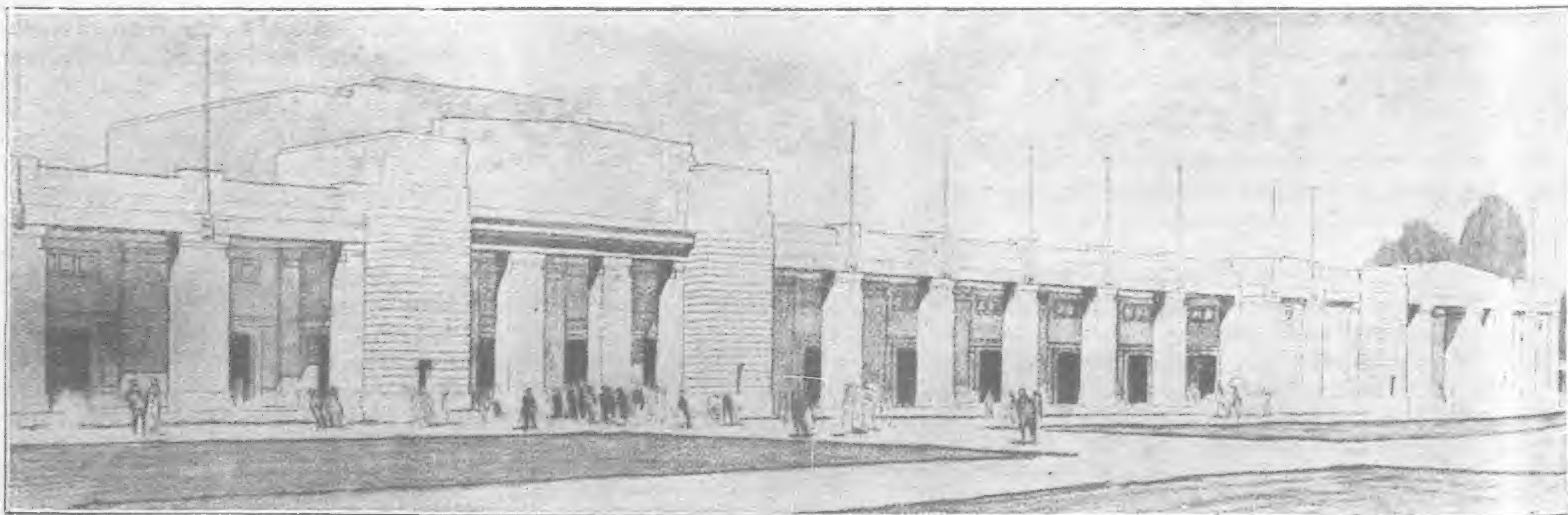
constructed—the only one of its kind in the country. Apart from the use of the stadium for the cup final, the British legion will occupy it for a great athletic meeting on July 14th of this year, and on the following Saturday, July 21st, it has been selected for the Oxford and Cambridge *v* Harvard and Yale fixture. The question of using it for a series of inter-imperial fixtures during the summer of 1924, when many dominion teams will be in Europe to compete in the Olympic games,



View of North Entrance to Exhibition: Main Avenue and Gardens

is now being examined with the athletic bodies concerned.

On the northern and southern sides of the stadium are the two great covered stands, both constructed of steel and reinforced concrete with an asbestos roofing. Each stand provides seating accommodation for 12,500 spectators, on a series of 31 terraces of concrete steps, rising 13-in. each time. The same terraces are prolonged without seats or cover round the eastern and western ends to complete the



One of the Main Entrances to the Industrial Hall

The above illustration is of one of the seven main entrances to the Industrial Hall, which, together with the complementary Machinery building, will contain the principal British exhibits. The two buildings together cover an area equal to about four and a half times that of Trafalgar Square. They are constructed of cement concrete blocks and reinforced concrete. Mural decorations of a symbolic character will fill the long panel above the Cornice, and heraldic panels will be painted in the spaces above the Entrance Doors in the inner wall of the Portico. These doors lead into a spacious octagonal Entrance Hall measuring 46-ft. by 9-ft., with a domed and coffered ceiling 35-ft. high. The motive of the design is that of solidity: an endeavor has been made to illustrate the size and grandeur of the Empire by buildings of a simple and dignified character.





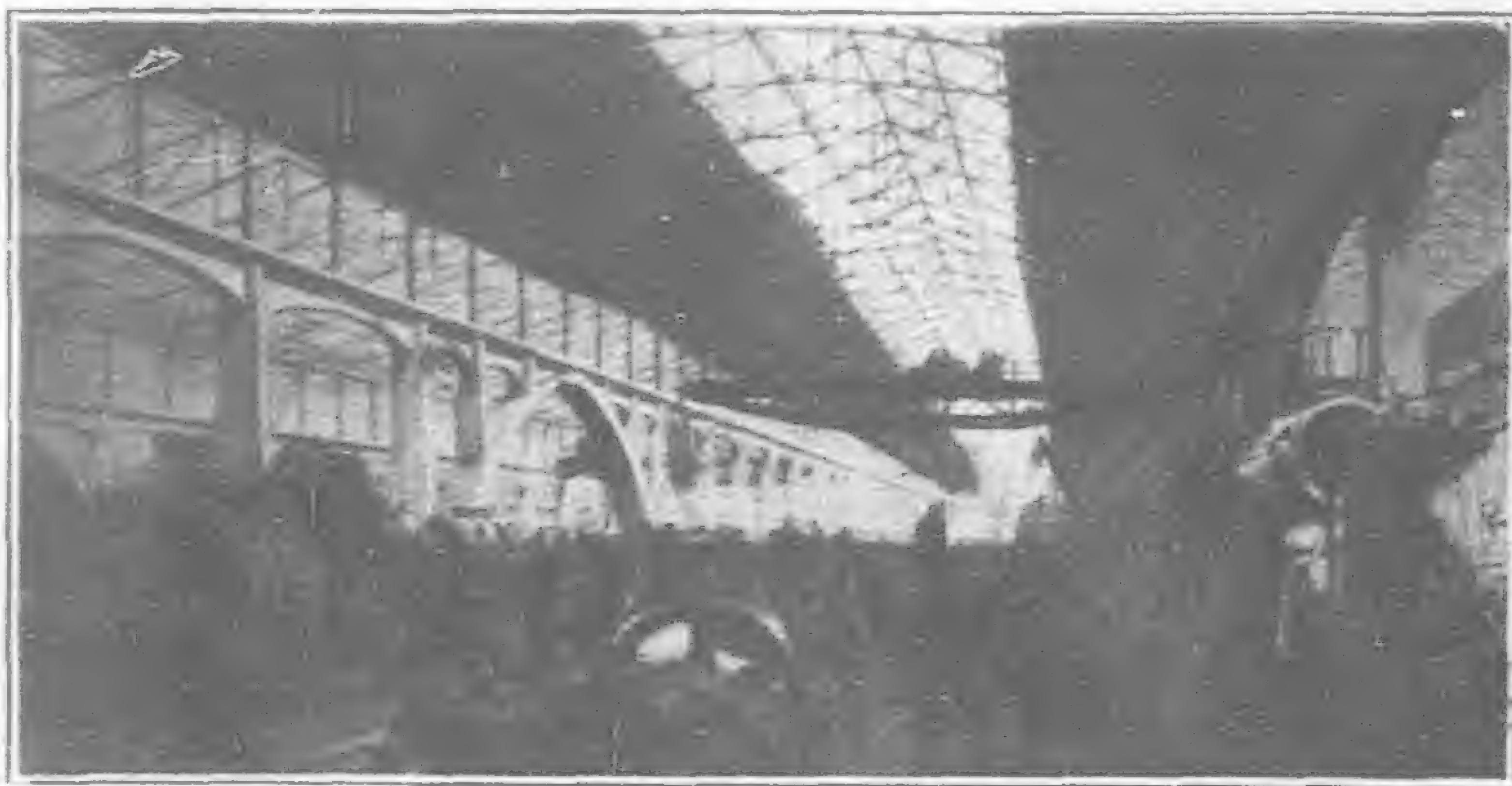
View of Palace of Machinery as it appeared in course of construction on May 25, 1923

while the steel rods for reinforcing the concrete numbered over a quarter-of-a-million, and if laid out in a row would have stretched from London to Aberdeen. One curious feature of the stadium is its remarkable acoustic properties. These are so remarkable that a man speaking from the royal box on one side can be heard quite distinctly at the back of the stand on the other side of the arena. This quality will be put to good use during the exhibition, when Dr. Charles Harris, the director of the imperial choir and a Canadian by adoption, will conduct a series of open-air concerts with a choir of 10,000 voices.

While from the nature of the layout as well as from its architectural treatment the stadium dominates the whole park, the use of concrete on such a large scale architecturally throughout the exhibition marks a very important advance in construction and design. Hitherto reinforced concrete has been regarded almost entirely as a purely engineering process and material. The buildings of the exhibition have offered such a wide scope for variety in design and manipulation that they may be expected to give a very great impetus to the use of concrete in the future. They will show how extraordinarily adaptable concrete is, and how, if treated upon its own merits and not as imitation stone, it will lend itself to the production of really monumental and classic buildings.

### Brid's-eye View of the Exhibition

From the centre of the stadium terrace the ground falls rapidly towards the chain of lakes running east and west for a distance of nearly half-a-mile. Fronting the lakes on the northern side are the two main United Kingdom buildings, each of them with a floor space of half-a-million square feet (over



As the Palace of Machinery will appear on completion in 1924

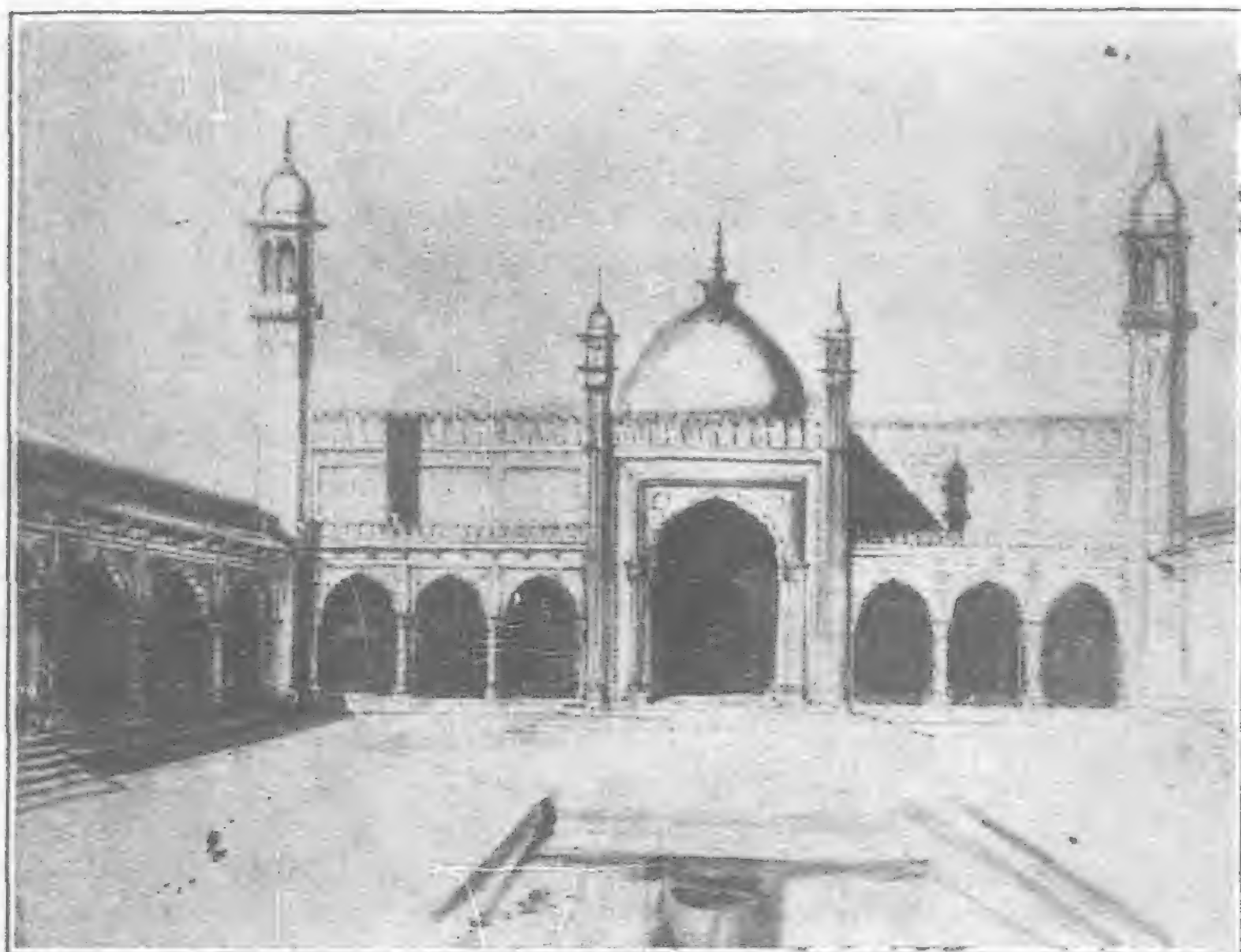
oval. The uncovered concrete terraces and a lower oval between them and the cinder track—mostly cut out of solid ground—together provide standing room for over 90,000, and this, with the ring seats and the two covered stands, brings the total capacity of the stadium to over 125,000. Running round the whole building is an interior corridor 60-ft. wide, which gives access to the terraces by means of 49 tunnels and a series of staircases to the covered stands. At one point the corridor narrows to give room for the great banquet hall, which has been designed to seat 1,000 guests at dinner. Above this again is a tea room, flanked on the exterior by a concrete terrace from which there is a fine view, stretching away beyond the Welsh harp to the north-east and Harrow School to the north-west. At the western end of the stadium are the players' quarters, including changing rooms, baths and gymnasium, and above these is a whole series of offices, surmounted by a control tower, whence there is a perfect view of the ground. The royal box is in the centre of the north covered stand, and beneath it is the royal retiring room. A press gallery running nearly the length of the northern stand is approached by a separate staircase, and has adjoining it a suite of rooms with telegraphic and telephonic facilities.

It is not merely its size that renders the stadium a remarkable achievement. The elevation gives one the impression of simplicity, dignity, and strength, and the clever fluted shuttering on the walls breaks the monotony of the concrete. Viewed from the central avenue of the exhibition, the broad northern terrace flanked by twin towers is a dominating feature, and gives the keynote to the whole architectural design of the exhibition. Some 25,000 tons of concrete and 1,400 tons of structural steel work were employed in the work of construction,



Another View of the Palace of Machinery in course of construction on June 29, 1923





**The Indian Pavilion**  
(Suggested Design)

The design of the Indian Pavilion is representative of Indian architecture as a whole. Portions have been reproduced from as large a number of different buildings as possible, due care being taken to avoid incongruities. The Taj Mahal and the Fort at Agra, the Jamma Masjid and the Pearl Mosque at Delhi, and Benares and Udaipur have all contributed

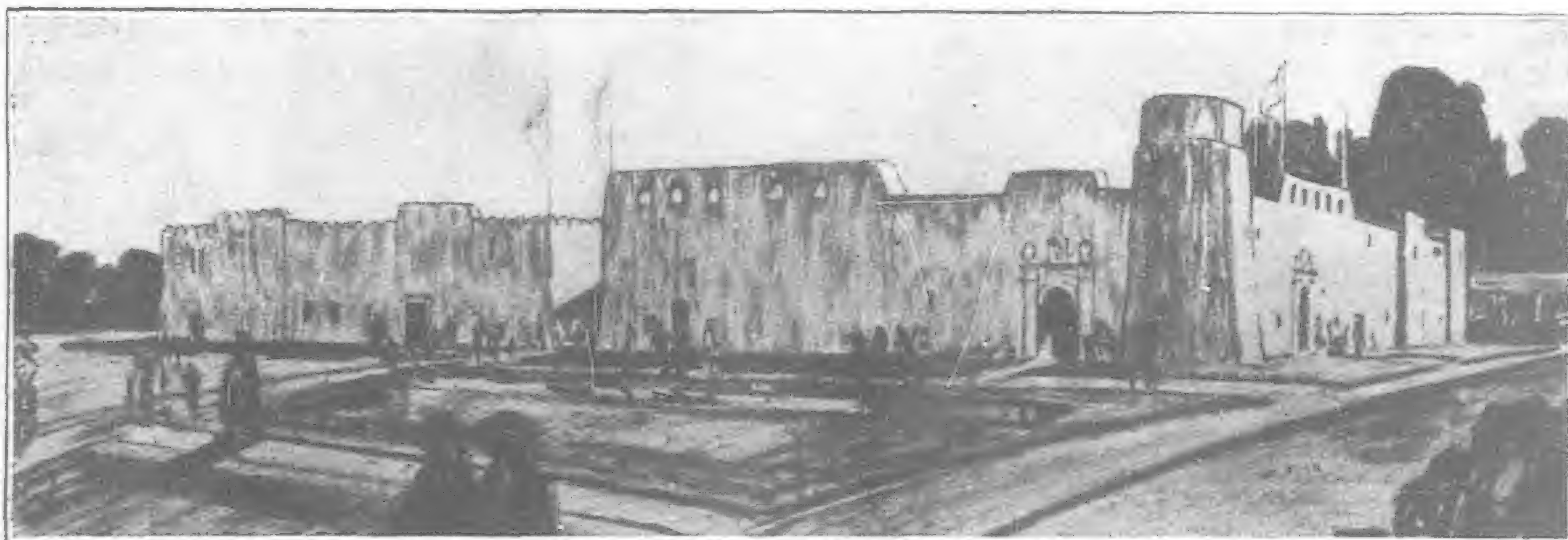


**Entrance to the Burmese Village**  
(Suggested Design)

In the foreground stands a pair of Leogriffs, 25-30-ft. high and decorated in gorgeous colors. These are being specially brought from Burma. Behind them stands a bridge house, and in the stream running beneath it visitors will see Burmese miners engaged in ruby washing

eleven acres). These are the palace of industry and the palace of engineering. Both are of the concrete construction already described. Each building has two façades. One faces the chain of lakes and the other the axial line of the park, which runs north and south and separates the two buildings by a fine avenue 250-ft. wide, already lined with chestnut and lime trees. Both buildings are well advanced and are scheduled for completion in August. The exhibiting space in each is already practically booked up.

On the southern side of the lakes and nearer the stadium are the two sites on which Canada and Australia are about to start the construction of their respective dominion pavilions. These will each occupy a floor space of about 150,000 sq. ft. (between three and four acres). The main elevation will face the lake, and the two dominions will be separated by the continuation of the main avenue, which crosses the lakes by a bridge and leads up to a series of cascades and fountains. At the eastern and western ends of the lakes respectively are the pavilions of India and New Zealand. The Indian pavilion (already in course of construction,) and the Burmese pavilion, which adjoins it, have been designed by Sir Charles Allom in oriental style based on the finest examples of native art. Much of the decorative work is being carved and sent over from India and Burma. India will occupy an



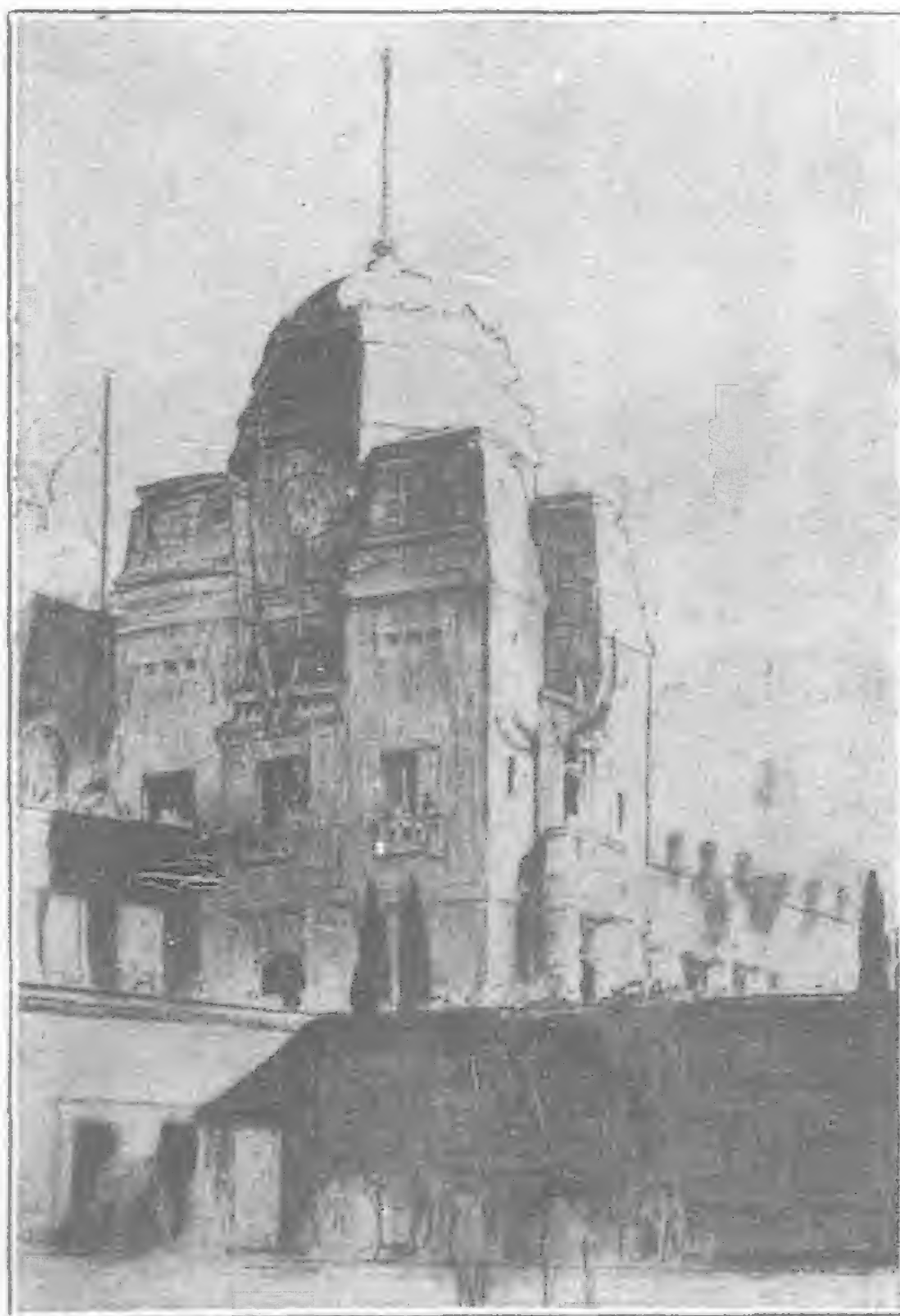
**The West African Building**

area of 90,000 sq. ft. (over two acres) and Burma 25,000 sq. ft. (over half-an-acre). The New Zealand pavilion is being designed by the exhibition architects and consulting engineer, Messrs. Simpson & Ayrton and Mr. E. O.

Williams, and will be 50,000 sq. ft. in area (over one acre).

Owing to the expansion of the plans of the Union of South Africa, a larger site than was originally contemplated is required for the South African pavilion. It will now be constructed east of the stadium, with the façade facing the broad road which runs between the lakes and the Indian pavilion, past the Burmese pavilion, and on to the southern boundary. In this southern section of the exhibition will also be housed the East and West African groups of colonies. The West Indies and Atlantic group have made extensive preparations for their participation in the exhibition, and will probably occupy a position between the South African buildings and the agricultural section.

Between Australia and New Zealand, and very near the southwestern entrance to the exhibition, an open-air swimming and diving pool is now being constructed. This when complete will be not unlike an ancient Roman bath. The bath itself is 325-ft. long and 60-ft. broad, and varies in depth from 3-ft. to 14-ft. Concrete terracing on either side will accommodate 1,750 seated spectators, and dressing rooms, slipper baths, and a toilet club adjoin.



**The Stadium—East Tower**



North of the palaces of industry and engineering is the northern entrance, whence visitors coming from Wembley Park station will get their first view of the exhibition. Passing down a broad flight of steps the visitor will come to a massive entrance hall with colonnaded front. The entrance hall will give a vista over five acres of open gardens and up the grand avenue to the stadium. The gardens will be encircled by an open classic colonnade leading to the main exhibition buildings. Flanking the gardens on the east will be the entrance to the amusement park and, facing this, a group of colonial buildings, including Ceylon. The exact sites of some other colonial groups are not yet finally settled, but so far as can be seen there will be no part of the empire which will not be represented at the exhibition.

To the east of the new loop line of railway which traverses the exhibition grounds will be the agricultural and horticultural sections, filling a space half as big as the whole of Wembley Park proper. Here again the final plans have still to be settled, but one object is to provide a group of model farmbuildings with accommodation for the leading British and dominion breeding societies. Arrangements are being made to secure a representative collection of pedigree stock, not only from this country but from the overseas dominions, where the quality of pure bred herds and flocks has reached a very high standard. It is understood that Sir Trustram Eve—who will be chairman of the Farmers' Club in 1924—is making arrangements for the Farmers' Club to have a club-house in the agricultural section and to be the host of the dominion farmers visiting the exhibition. The club will possibly be housed in a fine old tithe barn which is being loaned to the exhibition, and which will find a final resting place in the national institute of botany and agricultural museum at Cambridge. Access to this section will be through a series of gardens devoted to horticultural exhibits, designed to furnish an attractive display in massed colors.

Examples of contemporary art from every part of the empire will be housed in a fine art pavilion adjoining the palace of industry. This pavilion, occupying over three-quarters of an acre, will also contain a loan collection of British art, both modern and retrospective.

Plans are being made for a series of conferences, principally of an industrial and scientific character, to be held at the exhibition during the summer of 1924. These conferences will take place in the conference building, which will contain three large halls, the largest of them capable of seating 1,800 people. The conference hall has been adapted for use also as a concert hall, and will be the home of a series of chamber and orchestral concerts.

As may be inferred both from this brief survey and from the accompanying illustrations, the general architectural treatment of the exhibition buildings intentionally severely classic. The severity of the layout will be relieved by the wealth of color in the gardens and by the introduction of gaily colored kiosks and smaller buildings, and at night the exhibition will be lit by a new system of flood lighting in various colors or blends of colors, arranged to accord with the temperature.

### Transport Arrangements

The problem of persuading the public to visit an exhibition in this country has never been exhaustively studied. The disparity, for example, between the attendance at the Paris exhibition of 1900 (over 52 millions) and the attendance at the Franco-British exhibition of 1908 (under nine millions) is proof of that. There ought not to be any difficulty, at least of an insurmountable nature, in persuading 30 million people to visit Wembley Park, and it is from that point of view, *i.e.*, an average daily attendance of 150,000, that road and rail communications have been studied. Hitherto the fact has not been sufficiently appreciated that although an exhibition may be located within the London area, at least 50 per cent. of its potential visitors come from the provinces. Two stations, those of Wembley Park (Metropolitan Railway) and Wembley Hill (London and North Eastern—formerly Great Central—Railway), adjoin the two main entrances to the exhibition, and a third station on a north-eastern new loop line is being built in the exhibition grounds. Wembley Park station has been entirely rebuilt by the Metropolitan Railway during the past few months. Nineteen booking windows have been installed to deal with the traffic from six wide platforms aggregating over 2,500-ft. in length. A two-minute service and the reduction of the time of the journey

from Baker Street to ten minutes will enable the Metropolitan Railway to handle at least 30,000 passengers per hour, while the through trains which can be run from almost every part of London will provide direct traveling facilities from all parts of the country. Wembley Hill station has also been enlarged. This station, reached from Marylebone, will relieve direct traffic from London, and in addition will tap a wide area of the Midlands and the North through the provincial connections of the North Eastern Railway. Again, five minutes from the south-western entrance to the exhibition is Wembley station, on the old north-western main line, now part of the London, Midland and Scottish Railway system. Side by side with this station is the Bakerloo tube, while connected with a ten-minute bus service there is Sudbury station on the district railway. No doubt Alperton and Stonebridge Park stations will also be used by many visitors. Altogether, eight railway stations are within easy reach of the exhibition.

So far as road traffic is concerned, the problem has been not only the improvement of existing roads, but the provision of a new main trunk road from London which would relieve the Harrow Road. This has been accomplished by the widening of Neasden and Forty lanes and the utilization of a portion of the great North Circular Road. This relief road, partly on account of its width and partly because it is fed by many roads from the suburbs and provinces, will probably become the chief method of access for motor cars and charrs-à-bancs, leaving the Harrow Road for the existing bus services and trams.

Owing to the size of the exhibition grounds, which in the aggregate are more than double the area of the Franco-British exhibition, the problem of internal transport has had to be considered. Obviously it is no use bringing thousands of people to see the exhibition and then exhausting them physically in their efforts to cover the wide distances from pavilion to pavilion. To obviate this there will be a continuously moving platform right round the exhibition. This will consist of two moving pathways traveling along the principal roads at speeds of two-and-a-half and five miles per hour. The passengers on the faster platform will be seated and the platforms where they intersect with other roads and entrances to buildings will dive below ground. The principle of a moving platform is, of course, familiar to passengers on the underground, but no attempt has previously been made in this country to adopt this means of transport on the scale which will be used at the exhibition.

### Wealth of Empire Resources

So far as the dominions and colonies are concerned, it is impossible within the limits of this article to describe at any length their plans. It may be remarked that the total expenditure incurred by them will exceed very considerably one million sterling. From the point of view of the overseas empire the exhibition is part of a great publicity campaign, the objects of which are adequately to fulfil the three great needs of every dominion—men, money, and markets. The development of dominion resources demands an increased population, but it also demands the investment of very considerable capital. Finally, such development cannot really come into its own unless and until markets can be found for dominion produce. In this direction there is a wide field for educational effort. The function of the exhibition is to assist in the work of education. The dominions and colonies, by means of their pavilions, will demonstrate the progress which they have made in the development of their food products, their raw materials, and their manufactures, as well as the opportunities which they afford for further development. So far as food products are concerned, the restaurants will help to drive the lesson home. This, however, is only a means to an end, and it would be idle to pretend that the exhibition can accomplish its final purpose without a campaign on much more extended lines. From the autumn of the present year until at least the autumn of the year following the exhibition, the dominions and colonies must be prepared not only to invest their money in making known their resources, but to convince the public of the adequacy of supplies. If their advertising propaganda is carried out effectively, they may assume that every visitor who eats half an ounce of dominion butter at the exhibition will want to buy a pound of it for his own home, and that of every hundred customers who purchase the pound of butter, at least 50

(Continued on page 709)



# New Hematite Reduction Process

## Anzan Iron and Steel Works

By S.M.R. Co. Intelligence Department

**A**T the present moment when the town of Anshan, the seat of the S.M.R. Co. Anzan Iron and Steel Works, expects to emerge out of the gloom, in which it has lain enveloped since the close of the war, how this welcome change has been worked out must be of more than a passing interest to everybody, especially those concerned in iron and steel manufacture. We have given in these columns in a fragmentary way, from time to time the circumstances that have come to shed a ray of hope upon the almost desolate railway town of Anshan.

### Discovery by Geologist and Poet

In August, 1908, Mr. C. Kido, then superintendent of the S.M.R. Co. Geological Institute, who is son to the late Marquis Kido, one of the three greatest figures in modern Japan, with the late General Saigo and the late Marquis Ohkubo, and retired from the Company's service at his own request last April, happened to become interested in the name of a small hill at the west of Tangkangtzu station, well-known for the hot-springs close by, on the S.M.R. main line. It is called Tiehshihshan meaning in English "Iron Stone Hill." Mr. Kido, the geologist, started investigation and soon found that the hill hoarded an iron mine. This was the first discovery of the mine.

The subsequent investigations resulted in locating East and West Anshan, Takushan, Yingtaoyuan, and Hsiaolingtzu mines, in addition to Tiehshihshan mine, the first to be discovered. The S.M.R. Co., wishing to work these mines, approached the Chinese authorities with its proposition to mine them more than once, but without results. By the Sino-Japanese treaty concerning Manchuria and Mongolia, as signed in 1915, China has conceded to Japan the privilege of exploiting the Anshan mine district as an item of many concessions. Consequently the establishment of an extensive iron and steel works was planned. To start with, a new company under Sino-Japanese joint management was founded as a mining agency in March, 1916. It is styled the Anshan Chenhsing Mining Company. The understanding arrived at was that the new Company should supply iron-ore as material for an iron and steel works to be formed and managed by the Railway Company. Permission, therefore, was applied to the Tokyo government, and was granted in October, 1916.

At first, a plant capable of turning out 1,000,000 tons pig-iron annually (from which 800,000 tons of steel manufactures were to be put out) was planned. As the first step, the construction of two blast-furnaces, each with a daily capacity for 200 tons, together with the necessary auxiliary plants such as the coke-ovens, etc., was proposed. The drawing up of the plans was commenced in summer, 1916, and those for the two blast-furnaces had been almost finished by December, 1916, when with the great war in full blast, the iron and steel industries had reached their highest boom. Accordingly, the original plan was enlarged by adding thereto the erection of a steel manufactory besides two more blast-furnaces so as to increase the total annual production of pig-iron by 300,000 tons. This extension plan was well started on the road to execution, when, in 1919, the colossal war was brought to an end, and the so-called "war-industries" that had sprung up and flourished like stories in a fable during the war, were plunged at a drop to the depth of inactivity and neglect. This pushed the general economic market down to the bottom of depression. Then the presence of the tremendous surplus in iron stocks was raised to an exceedingly troublesome question in Japan. The dealers concerned stood aghast at the almost bottomless fall of the iron and steel quotations.

The Railway Company, grasping this sharp turn in the situation, at once suspended the construction of the third and fourth furnaces and the steel manufactory. In the meantime the second blast-furnace was completed in June, 1919. However, the relation of demand to supply on the iron market had to be considered. First of all, the question how to treat poor-ore awaited some workable solution. Therefore, the operation of the newly completed furnace was deferred, and only one furnace was kept at work.

### Vital Question of Ore-Concentration

The Anshan mine district was found to contain an immense reserve. The investigations made so far placed the total reserve of ore containing more than 35 per cent. at about 200,000,000 tons. However, the major portion of the reserve is found to consist of poor-ore under 50 per cent., the rich ore occurring only in a limited quantity. Upon the commercially workable solution of this question of treating poor-ore, the future of the iron and steel works was considered to depend. Thereupon, with the discontinuation of all the enlargement plans, as above stated, a systematic study of how to deal with poor-ore economically was taken up, while the older blast-furnace was continued in operation.

In June, 1920, a party of American metallurgists and engineers were engaged to carry on a technical inquiry on the ground. They stayed about six weeks.

In September following, a practical experiment on a hematite reducing system, independently of the line of research pursued by the American specialists, was found to give an unexpectedly favorable result, and this, as event has proved, has furnished a precious clue leading to the key, with which the important problem of ore-concentration has been happily solved.

### Hematite Reducing System

The American experts worked on the line of turning poor-ore into rich ore by means of magnetic separation. As this belt is believed to hold an abundant reserve, the material available in the form of rich-ore will last a good length of time. However, the reserve of this zone does not wholly consist of magnetite, but contains an amount of hematite also. By the hematite reducing System, heating gas and reducing gas are made to operate upon hematite, in order to turn it into magnetite. It flashed upon the mind of the Japanese expert that it might be more successful to reduce the hematite into magnetite before subjecting it to magnetic separation, instead of following exclusively the separating method, as conceived by the American metallurgists, and in this happy conception they were subsequently confirmed.

There had been several methods of reducing hematite into magnetite. But, none of these methods had gone beyond the bounds of a laboratory scale, and never been applied yet to an enterprise on a sufficiently large scale for a business venture. At Anshan the experimenting of the same method on a factory scale was taken up. Next, indirect heating for the preliminary heating of the ore used to be adopted in most cases, and as to the ore, it was crushed into small lumps. At Anshan, the ore was subjected to direct preliminary heating on being crushed into no smaller sizes than intermediate. Then the reducing gas was made to pass through the ore-lumps without intermission. By this means the reduction of hematite into magnetite could be accomplished. This meant a remarkable improvement made in the working process. The ore so reduced was made to fall into the water to get cooled, so to raise the reduction efficiency. These were among the improvements introduced, and a perfect reduction could be effected by use of a furnace of a simple pattern. Besides, in both heating and reducing processes, economy in the consumption of gas was found possible to be effected.

Now that a perfectly reduced magnetite was placed within reach, further improvement in the magnetic separation process was sought. Crushers, tube mills, drying and concentrating equipments, and other necessary ones and magnetic separators were constructed on dimensions suited to a factory scale, and the entire reduction process was experimented upon continuously from beginning to end, and the efficiency in magnetic separation, together with the calculation of cost, etc., were carefully studied.

### A Valuable Discovery

A valuable discovery was made in the course of experiments, showing that there was a world of difference in separating efficiency



between use of magnetite in its natural form and its use after its reduction and concentration. How this favorable change could be secured was put down to an increase of the magnetite percentage by the reduction of the hematite ore, and also to a decrease in the consumption of motor power for the separation process applied to the reduced hematite owing to there being a wide difference in hardness, compared with natural magnetite.

At any rate, the application of the reducing and concentrating process to ore prior to subjecting it to magnetic separation was concluded to be the most advantageous method to be adopted at Anshan.

The Anshan mine contains hematite in the largest quantity, with magnetite occurring in the Takushan belt, which forms only part of the mining zone. Even magnetite put out from Takushan, it has been found, may be worked upon with advantage by first being put through the new reducing system. Several other samples of hematite obtained from other belts have been subjected to the same method with as satisfactory results.

But for the happy results given by the hematite reducing system, the major portion of the enormous ore reserve in the Anshan district would have had to be abandoned as little better than waste, excepting what is held in the Takushan belt. The new process has now demonstrated its potentiality to convert the almost valueless poor-ore into rich-ore at an economically workable cost. It may well be appreciated as a piece of brilliant triumph of science and perseverance, for Anshan especially.

There have been a number of patents granted to a similar process in the world. But, that for Anshan has been patented as one embodying a valuable improvement in working process itself. This feature would seem to make its invention doubly successful.

### What Might Have Been

Why the operation of the Anshan works has come to be brought to a deadlock is because of a fear that the rich ore reserve will prove barely sufficient to last only a few years even at the rate of 70,000-80,000 tons pig-iron per blast-furnace annually. Consequently, without the precious invention above mentioned, the closing-down of the works altogether would be inevitable from an economic point of view. Or, as the alternative the works would have to be retained in operation only as long as the natural reserve of magnetite in the Takushan belt is available, as proposed by the American specialists, thereby putting the plant in a comparatively disadvantageous position economically.

Thus, the invention and adoption of the new hematite reducing system has wrought a world of difference to the future of the works, and incidentally to the town of Anshan.

Now the works people are looking forward to the production of pig-iron at a reasonably low rate. On this very ground, brighter hopes may be built up by them for the second and third stages of the enterprise program, including steel manufacture, etc.

### First Stage Expansion Program

Concerning the first stage expansion program to be taken up from the present fiscal year, the sum of Y.11,000,000 or so is required for construction expenses, to be disbursed over three years, beginning with Y.500,000 for the current fiscal year, as already approved. The appropriation for the next fiscal year will be Y.7,000,000-8,000,000, with the remaining Y.3,000,000 for the fiscal year 1925. The principal part of the construction work will probably be executed in the next fiscal year 1924. Of the total disbursement, about 50 per cent. will be invested in the hematite reducing and the magnetic separation and concentration equipments, the balance left being for two more blast-furnaces, auxiliary installations for putting out 200,000 tons more of pig-iron, coke manufacture, reinforcing of motor power, manufacture of finer by-products, waterworks, etc.

At the initial stage of the steel works, the total annual output of pig-iron seems to have been estimated at 70,000-80,000 tons. At present, it appears easy to produce 100,000 tons a year per blast-furnace and may probably make the figure go above 100,000 tons by reason of added skill and riper experience. Thus it was the 200,000-ton annual production plan with two furnaces that was adopted at the outset, in order to work the existing two furnaces at full pressure. For lowering the cost of production of pig-iron at the Anshan works, the costs of the raw materials are to be reduced to the minimum, at the same time bringing down the general average cost by putting out as much pig-iron as the capacity of the plant permits.

However, the commercial side of disposing of the pig-iron outputs has to be considered at the same time, and on this account the manufacture of pig-iron in a large quantity can hardly be rushed hastily.

Therefore the new plan of the Company is to confine the total annual production to sufficient to let the two furnaces bring out to full play their manufacturing efficiency. It is for this reason that, as the first stage expansion program, a 200,000-ton annual production plan has been adopted. The detailed data concerning the extension plan, inclusive of costs of raw materials, current expenses, and other receipt and expense accounts are too dry and complicated to be reproduced in these columns. At any rate, it seems a moral certainty that at least the plant can be operated without incurring loss, as repeatedly confirmed by Dr. M. Ohkochi, professor of the Tokyo Imperial University, and three other authorities on metallurgy in Japan.

As to the second and third stage expansion programs, opinions may broadly vary as to whether or not a steel manufacturing plan shall be drawn up with a view to working upon the whole of the 200,000 tons; whether or not half the annual output only shall be set aside for steel manufacturing; or whether or not two new blast furnaces shall be constructed, so that, together with the two existing furnaces, the total annual output of pig-iron may be increased to 500,000 tons, upon the use of all of which steel manufacturing shall be planned.

With the recent earthquake about Tokyo and Yokohama glaring vividly in the experience of the nation, the question of building materials has been raised to one of universal and all-absorbing topics. The steel manufacturing plan of the Anshan works is in a way related more or less to the same question. The Railway Company naturally hopes to give a solution to the steel manufacturing program as early as possible by pushing forward its investigations with despatch.

Thus the Company is eager to realize the economic results of the establishment of the Anshan works and to develop it on most intelligent lines by concentrating the study and effort of the competent specialists on the Company's staff.

The Company is, at the same time, desirous of this problem of enlarging the Anshan works being carefully considered without misunderstanding or undue enthusiasm.

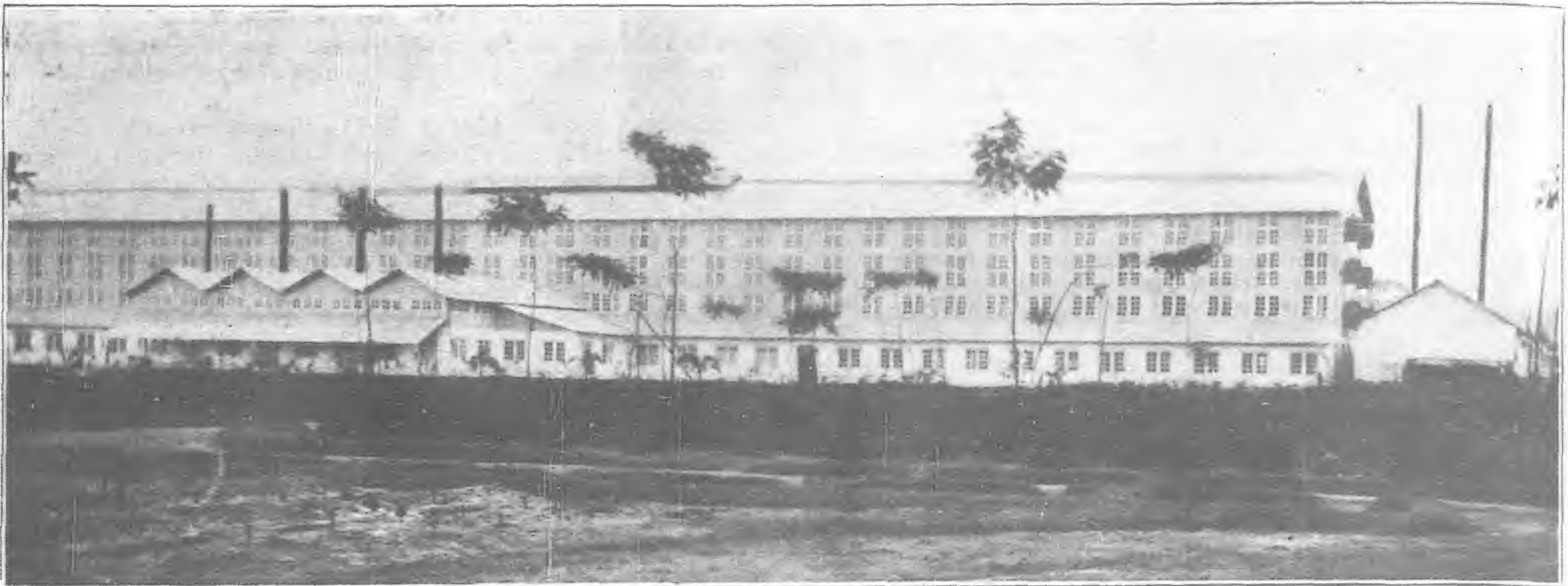
As the inventor of the new process of hematite reducing and magnetic separation, the name of Mr. T. Umene, formerly a member of the research department of the iron and steel works and now superintendent of the steel manufacturing office of the same works must be brought up to the fore.

When on the close of the great war in 1919, the iron and steel market of the world became seized with a panic, Mr. Umene cast about for some practicable way of rebooming the works, and he proceeded, with a firm resolution, to take up a course of painstaking research under the directions of Mr. T. Oka, assistant general manager of the works, additionally holding charge of the research department. The perseverance with which the intellectual effort of Mr. Umene and his assistants have prosecuted this important line of study, has at length been rewarded by the invention of a new superior process of hematite reduction and magnetic separation that has marked a fresh epoch in its application to a large scale business enterprise. This process has been duly patented by the Japanese government.

One point worthy of special mention is that Mr. Oka and the members of the research department, in addition to an immediate circle of the Company's officials directly concerned, have gone about their common task of unravelling the hitherto mysterious, but none the less valuable secret of success with a wonderful unison of purpose. They all have contributed the best shares of their effort quite apart from a materialistic reward, and the rich and glorious fruit that has ripened into this inestimable utility, is the off-spring of their tireless and devoted labors, that does credit to them and the Japanese at large, and may be held up as a brilliant triumph of science and perseverance. Next, to Mr. T. Suzuki, then at the head of the steel manufacturing office, Mr. Y. Adachi, then chief engineer, Mr. T. Yano, then chief accountant, and Mr. T. Yokota, then secretary of the works and now the Company's district agent for the Anshan district, who all have assisted Mr. Umene in attaining his grand achievement, a fair portion of the credit is also due.

This invention has not only brought a great boon to the Anshan works, but also is a matter for general congratulation for the empire at large.





One of the most modern Tea Factories in the East Coast District of Sumatra, owned by the H.A.V. (Handels Verenigen Amsterdam)

## The Java Tea Industry

*The J. C. Whitney Co., tea importers and exporters, with headquarters in Chicago, recently issued its Tea Talk No. 10, which deals in exceedingly picturesque and interesting style with the Dutch East Indian islands of Java and Sumatra*

### How Tea Growing Was Established in Java

**A**S early as 1609 the Dutch carried on a trade in tea between Europe and China and Japan (the first Dutch expedition to the East Indies having been in 1595 (taking up back to the time of Shakespeare and Queen Elizabeth, who had, we understand, an aversion to tea); it was not, however, until 1728 that the first attempt was made to grow tea in Java. It was not a success, and nothing further was done until 1826, when seeds and plants were again imported into the island. By 1830 the government realized that there was the making of a successful industry, and took over such areas as were then under tea. In 1832 tea makers came over from China. In 1838 an establishment was founded in Batavia, whither the product was brought from various estates to be finished. In 1839 Java tea sold in Amsterdam at 81 cents a pound, the government incurring a loss of 36 cents for every pound of tea sold.

During the next 40 years the possibility of the industry becoming a profitable one was realized. The quality of the tea, however, continued inferior, and it could not compete with that produced in British India.

In 1878, tea seed was first procured from Assam, and this was the turning point in the career of the Java tea industry. The Assam type of plant first grown has been so successful in Java that it has now become the standard type of the island. About

the same time, hand manufacture was replaced by machinery, and a considerable improvement in quality effected.

Between 1901 and 1914 tea production in Java increased from 16,750,000 pounds to 100,000,000. An experimental station was established under government control, and in connection with it there is now an experimental tea garden situated at a height of about 3,600-ft. above sea level. The quality of the tea shipped of late years has steadily improved, until to-day it is in regular demand. Production reached its height in 1919 with 110,541,200 pounds exported, but this included some accumulation from 1918 plucking. The year 1920 shows 93,680,400 pounds exported; so Java can produce approximately 100,000,000 pounds for export.

Curtailment of plucking was adopted in Java, as well as in Ceylon and India, during 1921 and 1922, export for both these years having been around 68,000,000 pounds.

The preferential duty placed by England and Canada on British-grown tea has cut off these markets somewhat for Java tea; but the lower prevailing prices of Javas against Ceylons and Indias bring demand to Java producers. Holland and Australia are the largest users of Java teas.

Prior to 1917 shipments of Java teas to the United States and Canada were exceedingly small, under 1,000,000 pounds a year, but war conditions, embargoes, etc., forced Java to ship very



Native women picking tea leaves



Tea tree field in the East Coast of Sumatra



large quantities to the United States during 1917 and 1918 (above 32,000,000 pounds in 1917). This seems to have introduced Java teas to American users, and export hither for 1920, 1921, and 1922 was 7,000,000 to 8,000,000 pounds per annum.

Not many years ago Java teas were purchased merely because of their low prices, and were considered suitable for use only in small quantities to reduce the cost of blends. Now Java tea, though in large part of common and plain-medium description, is as a rule carefully made and sorted so as to possess a regular appearance which attracts the blender. On the other hand, there is a Java tea grown at higher altitudes, having such flavor and bright tips as to make it suitable for use in substituting for British India and Ceylon teas; and for this class good prices are obtainable.

Though Assam-indigenous, Barcelona, and Tinguí *jats* (seeds) have been so largely planted of late years, the oldest tea of all, the China *jat*, is still vigorous, and yields well. With the China and Ceylon varieties, other native tea varieties were looked for in British India, and various kinds were found in the valley of the Brahmaputra, these proving very suitable for cultivation.

The yield from most of the estates is good, but the plucking is likely to be coarse. For the old China tea, 450 pounds an acre are about the average, but for the new labd more recently planted with good *jat* 1,000 pounds an acre are not an uncommon yield.

### The Estates in Java Highlands

The entire backbone of the island of Java consists of a chain of volcanoes, and between these mountains are situated plains many miles in length and breadth,—plains usually of incomparable fertility. On the slopes of these mountains, in western Java, in the Preanger residency or province, are the chief tea estates of the island. On the slopes of the Gedeh particularly, a mountain 9,700 feet high, are a number of fine tea gardens, of which one, the Goalpara on the Gedeh, produces some of the best tea on the island.

The soils are dark-colored, deep, friable loams, into some of which a stick can easily be passed to a depth of 18-in. The lay of the land is usually excellent, affording easy drainage. The gradens, for labor reasons, are widely scattered, generally not more than two tea estates adjoining. They are usually large, over 1,000 acres in cultivation being common, and are mostly owned by companies. The elevation of the land under tea ranges from 800 to 5,000-ft. but the greater area lies between 1,500 and 3,500-ft.

The rainfall is generally well distributed in the tea districts, and varies from 100 to 190 inches in October to January, these being the wettest months, while June to September are the driest.



Sumatra: Weighing tea leaves immediately after being plucked; an operation carried out in the morning.

The mean temperature at 1,000 feet is about 78° F. The best quality of teas is made during the dry season, the most luxuriant growth being in the wet months, November to February.

Changes of temperature have but little influence on the tea plant, which accounts for its being grown at greatly varying altitudes in Java and Sumatra, the only two islands in the Dutch East Indies where tea is cultivated.

### Effect of Seasons on Tea Growth and Quality

January. Wet season; heavy flush; liquor plain.

February. Wet season; heavy flush; liquor plain.

March. Wet season; considerable flush; liquor plain.

April. Rain less; flush smaller; liquor slightly improved.

May. Rain ceasing; flush smaller; liquor shows nice improvement.

June. No rain; small flush; liquor shows nice quality and flavor.

July. No rain; small flush; fine quality liquor.

August. No rain; small flush; liquor choice quality.

September. No rain; small flush; liquor choice quality.

October. Some rain; larger flush; quality of liquor often very good, if not too much early rain.

November. Rain setting in; large flush; cup quality usually poor.

December. Rain considerable; large flush, cup quality slightly improved against November.

The land is dug between each pruning, once heavily, 18-in. to two feet deep, and two or three times lightly; the cultivation in this respect being rather severe. On many estates water trenches are dug at frequent intervals between the rows across the slope, and these are filled up and new ones dug every seven months. Between the hoeings, weeds grow rapidly, frequently to the height of the tea bushes. On one estate monthly weeding is done, as in Ceylon. Most of the land is terraced, as well as trenched, so drainage to prevent wash is not required as in Ceylon.

Good seed is an essential, either with the direct-sowing method or with the previous construction of seed beds. The seed is usually tested before it is put into the ground, either by placing it in water or in a sugar solution or both; floating seeds being eliminated and sinking ones used (it being generally understood that the floaters are bad and the sinkers good). The sinkers are immediately put out at the distances required, the floaters being planted out separately with much less space between. The seeds are sown at a depth of not more than an inch from the surface and at a distance from each other of 10 to 20 cm. Seed beds are provided with a roof of leaves or grass, should their position require this.



Sumatra: A native woman is employed to inspect and direct the pickers



The first pruning is generally very high, and the work frequently indifferent; large, heavy knives being used. The style of bush grown is in many cases lanky and rather thin, and on these estates the wood, even on comparatively young bushes, has a gray, hide-bound appearance. When cleaned, however, the bark is green and healthy.

Many of the factories are new and consist of large and expensive buildings well supplied with machinery and lighted by electricity, which in several instances furnishes the motive power also. The walls are chiefly strong, bamboo matting, with pillars of stone or iron. Notwithstanding the flimsy nature of these factory walls, the buildings are accepted for insurance at a very low rate. One factory visited was turning out 750,000 pounds of tea from four buildings, with a combined floor space of 81,090 square feet.

In some factories withering is done on floors or *chungs* four feet apart as in Assam; a few have racks; while in others the leaf is spread on the floor. Sun withering is commonly practised. In one factory, at a high elevation where coarse plucking is adopted, circular drums heated with hot air are employed, after the leaf has been partly withered in the factory and in the sun; but the results as regards quality are poor, the leaf turning red in the process. As a rule withering is decidedly on the right side, and this may to some extent account for the amount of tip seen in the Java teas. Where both China and Assam bushes are grown on the same estates, the leaves are usually withered and manufactured separately.

Fermentation is generally heavy, from three to four hours in several factories. The leaf is spread on the floor without any covering cloth, so that there is a tendency for it to become dry. In other factories bamboo trays are used, which are carried out and spread over large barbecues near the factory, to complete the fermentation in the sun and to assist in drying.

All the factories visited were well supplied with firing machinery, chiefly of the large type. The temperatures are usually high, from 200° to as much as 300° F. and in some instances the teas are slightly burnt.

Sifting is generally very thorough, a considerable amount of hand sifting being done after the tea has passed through the sorting machines. Sortations follow the same lines as in India and Ceylon, with teas made largely into orange pekoes, pekoes, broken orange pekoes, and broken pekoes, and smaller percentages of flowery orange pekoes and souchongs. The hand sieves employed are of fine bamboo mesh and not of wire. Fannings and light leaves are separated by manipulation with bamboo winnowers, from 30 to 50 coolies often being engaged in this work alone. The result of this careful sorting is that teas are very uniform, full of tip, and of desirable appearance.

In some factories withering is done on floors or *chungs* four feet apart as in Assam; a few have racks; while in others the leaf is spread on the floor.

The final sortation is done by women, who do it by hand, the main purpose being the elimination of the still remaining red stalks and other impurities, such as bamboo fiber, etc.

### Java's Marvelous Roadways

A feature of the Javan islands greatly appreciated by the tea man are the roadways, which form an intricate and excellent system extending throughout the island. The three main trunks of the present road system date back to the famous Hundo period in Java. The rivers were crossed by large and powerful bridges of bamboo and teakwood, which were kept in perfect condition, while the roads were made durable and able to bear heavy weights by means of hewn teak trees. To-day the whole island is intersected with main roads, post roads, cross roads, and byroads, winding amid luxuriant tropic growths, past quaint villages, peopled by what seem to be gaily dressed fairies. There is literally no point in Java which the tea man cannot easily reach by carriage or motor car, and, with characteristic Dutch system and thoroughness, fresh horses for the former and the necessary equipment for the latter are procurable about every five to ten miles on the main roads. Thus traveling away up into the mountain districts, among volcanoes and tea gardens, is both easy and delightful.

The island of Java is about the size of the state of New York, its area being close to 50,000 square miles. Within this area is a population of over 40,000,000 people, making it the most densely

settled section of the world. The trade of the island is facilitated not only by means of roads, but also by a total length of railway of 1,680 miles, and some 770 post, telegraph, telephone, and radio-graph offices.

### Sumatra Enters the Tea Game

The area of Sumatra is 167,480 square miles and its population in 1916 was only about 4,000,000. The greater part of the island is not fully explored. In 1910 the government of the Netherlands Indies appointed a commission to inquire into the possibilities of tea culture in the Padang highlands of southwest Sumatra. As a result of the particularly favorable report of this commission, certain tracts of land were applied for and the estates are now producing. At about the same time experiments were made near the east coast in the district of Siantar, and the growth of the tea plant was so successful there that a number of tea estates have been established. The district of Siantar, where the lofty Sumatra mountains stand on guard like giants of granite and volcanic rock, lies between the town of Medan and Lake Toba.

Total production has been growing, having been approximately 5,000,000 pounds in 1918, 9,000,000 in 1919, 11,000,000 in 1920, and 9,000,000 pounds in 1921. Shipments to the United States have been exceedingly small, not more than 250,000 pounds a year, the larger quantities going to England and Holland.

### Special Items of Interest

The tea plant is much more subject to the rainfall than the temperature, which is evident when it is taken into consideration that tea culture is a leaf culture, and the production of leaves is of course to a great extent dependent upon rainfall. Long periods of drought are therefore destructive to the culture, and the laying out of tea gardens in districts which have an insufficient or very irregular rainfall must be guarded against. Fortunately most districts in Java and Sumatra, especially the hill districts, possess an abundant tropical and mostly regular rainfall, enjoying in this respect a very favorable position.

In Sumatra, in all probability the island of the cultivation of tea, the first plantation was opened about 13 years ago in the Ophir district, close to Padang, on the west coast of the island. A few years later the laying out of plantations was also begun in the rich producing district of Deli, on the Siantar plateau.

The tea is rather partial to certain kinds of soil. It prefers, taking the quantity of the product as criterion, soils rich in humus, not too heavy, and if possible virgin forest. The less nourishing volcanic soils yield as a rule a smaller quantity of produce, but often of excellent quality. It is, however, very dangerous to generalize, frequently very extraordinary exceptions occurring.

New grounds may be mainly divided into two main groups,—virgin forest, having heavy upper growth, and old cultivated grounds, used previously for some European or native culture, and therefore covered only with low shrubs and grass.

## Two Department Stores for Shanghai

Five or six years ago a company of Cantonese, the Sincere Co., Ltd., put up a building as high as the laws of the international settlement allowed, six stories. Two years later another company from Canton, called Wing On's, bought ground across the street from the first, and built. Both firms have stores in Canton and Hongkong.

China has only a 5 per cent. tariff and stores here are able to sell imported goods at reasonable prices. In some cases American goods are marked at less than in the United States. Concerning the new companies to be established here, a local newspaper says:

"Shanghai may in the near future expect to see two new 'palace emporiums' or department stores in Nanking Road." Nanking Road is the chief foreign retail thoroughfare of the city, and of the Far East. As with the Sincere Co. and Wing On's, the promoters of the new firms are Cantonese, S. K. Lau, who has retired from the management of the Sincere Co., being the founder and general manager of one, which will be known as the Sun Sun Co. The other is the Great Sun Co."



# Beet Sugar Industry in Japan

By H. C. Huggins

**H**OKKAIDO, the northernmost of the large islands which compose the 'mainland' of Japan, is the centre of a growing beet sugar industry which is expected in the not far distant future to make Japan entirely self-sufficing so far as sugar supplies are concerned.

Despite the marvellous growth of the sugar industry in Taiwan under the Japanese control since 1904, it has never yet been possible to raise sufficient cane in the Taiwan fields to keep the Japanese sugar mills occupied at anything like capacity for more than a small part of the year. The shortage of raw material needed to maintain production in the refineries has always been imported from Java and Cuba, and Japan's purchases of sugar abroad have been a considerable item in an unfavorable balance of trade.

The Taiwan sugar fields being inadequate to supply the needs of a growing demand for sugar in Japan, attention was turned to developing the extensive agricultural lands in the Hokkaido for the culture of sugar beets.

As long ago as 1888 experiments in sugar beet cultivation and beet sugar extraction were carried on in the Hokkaido under the supervision of American sugar engineers, but owing to lack of knowledge and interest on the part of the farming class, leading to utter indifference to the best methods of planting and growing, and on the part of the refiners causing damage to the beets in handling and refining, the results obtained were not such as to stimulate any great enthusiasm for sugar beet growing and the investment of capital in the Hokkaido in beet sugar refining.

It has been only in the past five years since the high prices reached by sugar during and after the war, that attention has been turned to beet sugar in Japan. Naturally the Hokkaido was the only location for such an industry, and there it is now being centred.

## Cultivation of Sugar Beets

The population of the Hokkaido is small and the easily cultivated lands of that island which physically resembles the Pacific

northwest, are sparsely settled and only cultivated in certain well-populated centres. To grow sugar beets it was necessary to induce the immigration of farmers from Japan proper (the island called Honshu), and to do this meant that it was necessary to give inducements to the immigrants.

The Hokkaido government sold land to the beet sugar companies at very low prices, which was again sold to immigrant farmers at cost on very favorable terms of payment over a long period of time. Those who did not care to buy land were allowed to lease holdings provided they contracted to devote a fixed part of the land to sugar beet growing, the beets to be sold to the companies at a fixed price. The factories not only contract with the farmers for all the beets they could raise, but also pay a good bonus to those farmers who show the largest crop per acre, and for beets with high sugar content. The companies buy the seed abroad (in Germany and Siberia), and distribute it to the farmers. During the season of growth, from March to September, the crops are under the constant supervision of experts employed by the factories. There are about 20,000 acres now under cultivation and this represents not more than half of the land owned by the sugar companies.

The Hokkaido beet crop matures early in October and from October to January continuously the mills are operated day and night in order to handle the beets harvested. There are no holidays and labor in the mills works in 12-hour shifts uncomplainingly. The farmers and their families supply the larger part of the labor needed in the mills, and thus add to their incomes. This attracts the better class of farmer from the main island, and despite severe crop failures in the first year of growing the farmers have continued to plant as desired by the companies and have remained at their work.

## The Factories

By far the most important of the beet sugar companies is the Hokkaido Sugar Company, which was originally capitalized at Y.10,000,000. This company owns an operating mill in the town of



SHIMIZU BEET SUGAR FACTORY





Hauling Beets to Storage Houses

Obihiro, erected in 1920, and started up the same year. The factory was erected at a cost of Y.3,000,000, and it is the centre of industry in the town which has a population of about 15,000, and is situated in the centre of a prosperous agricultural region. The sugar industry is attracting attention and the region's population is increasing. It is said that about Y.500,000 is annually paid the farmers for their sugar beets, and this sum goes far to increase the prosperity of the whole region.

The Obihiro mill was erected by American engineers, and it was designed and completely equipped by Dyer & Company of Cleveland, Ohio, U. S. A. The normal capacity is 600 tons of beets each 24 hours. This should produce about 80 tons of white granulated sugar, best quality, each day during the season. The Hokkaido sugar beets are the equal of the American in sugar content. The dry granulated sugar produced in the Hokkaido is pure white, and is packed in matting bags containing 100 *kin* (133-lb.) The dried beet pulp which is the by-product of refining is used as a dairy cattle food. Hokkaido is particularly rich in dairy products it being about the only part of Japan where good grass for cattle food grows without cultivation.

The Hokkaido Sugar Company owing to the general depression of business has not been able to pay dividends on its rather high capitalization. This was recently reduced to Y.5,000,000, the paid-up capital being Y.4,000,000. The company originally owned some 45 miles of railway operating in its sugar territory, but this has been transferred to a subsidiary corporation. This company is controlled by the Teikoku Sugar Company, one of the prominent cane refining companies in Japan. This company belongs to the so-named "Matsukata" line—in other words it is financed by the Matsukata interests under the direction of Mr. Shokuma Matsukate, son of Marquis Matsukata, who was one of the elder statesmen of Japan.

The Dai Nihon Sugar Co., one of the largest of the Japanese cane sugar companies, owns a beet sugar plant at Shimizu, some tens of miles distant from the Obihiro plant of the Hokkaido Sugar Company.

The Shimizu plant of the Dai Nihon Sugar Company was completed in 1922, and only recently started up. It was built by the same engineers as the Obihiro mill, and equipped by the same makers, with exactly the same machinery, so that its capacity, and potentially its performance, are not different from its rival.



Loading at a Way Station

The two mills now in operation in the Hokkaido are modern in every respect, they are fireproof, the floors made of concrete, and all the machinery is driven by electric power. They are both, despite their different ownership, under the direction of an American engineer, and in each plant there is an American sugar expert in charge of production.

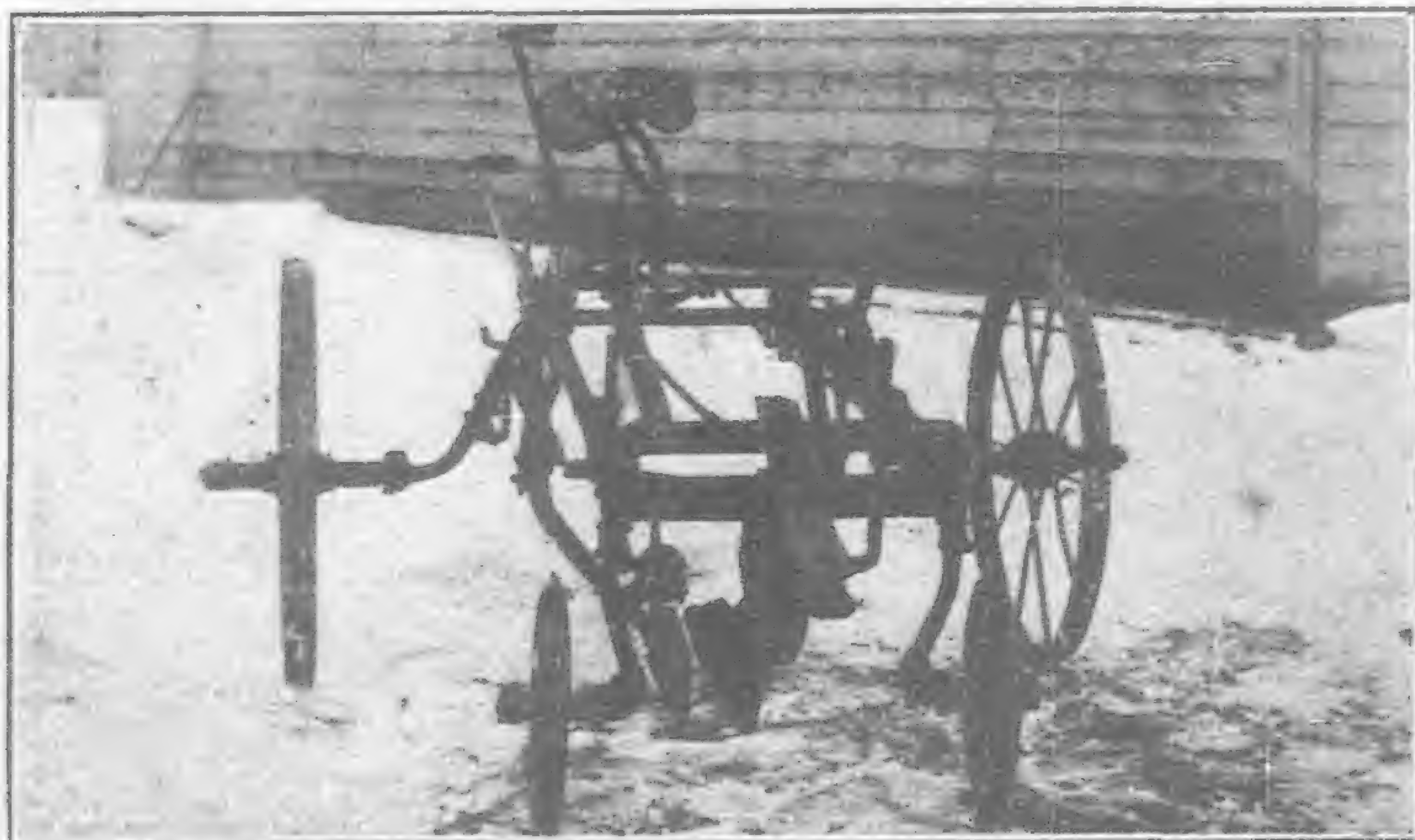
Labor is cheap in the mills, and the labor costs represent only about 20 per cent. of the cost of production. The other 80 per cent. represents the cost of the beets. Perhaps sugar beet refining in the Hokkaido can be carried out at a cheaper cost than in any other country in the world. Should this be possible, and the industry be developed, despite repeated discouragements in its inception, the competition of Japanese beet sugar on the Asiatic continent with Javan cane sugar may in the future be very difficult to meet.

Sugar consumption in Japan is on the increase, year after year. Unfortunately the Japanese consumption tax on sugar which is Y.9.00 per 100 *kin* (133-lb.), on the quality of sugar produced from sugar beets in the Hokkaido, seriously retards the increase in consumption per *capita*. The actual cost of sugar to the wholesale merchant is actually about 100 per cent. higher than factory cost, exclusive of manufacturer's profits.

The Japanese government is inclined to encourage the production of beet sugar in the Hokkaido. It is expected that with proper attention to methods it will not be difficult to refine 100,000,000 *kin* (133,333,333-lb.) of beet sugar a year.

### Beet Sugar in Chosen

The Dai Nihon Sugar Co., and the Chosen government-general for many years have been interested in the production of beet sugar in Chosen. In 1917, owing to the success obtained from the various experiments carried out under these auspices, the Chosen Sugar Company was formed to undertake the growth of sugar beets and their refining. This company was a subsidiary of the Dai Nihon Sugar Company. However, owing to the impossibility of obtaining a supply of seed from either Germany or Siberia during those troubled years, the plans of this company were abandoned for a time. This difficulty in obtaining seed held back the development of the beet sugar industry in Chosen and in Japan during the very years when capital was to be obtained in any amount.



Beet Lifters, loosening them in the ground

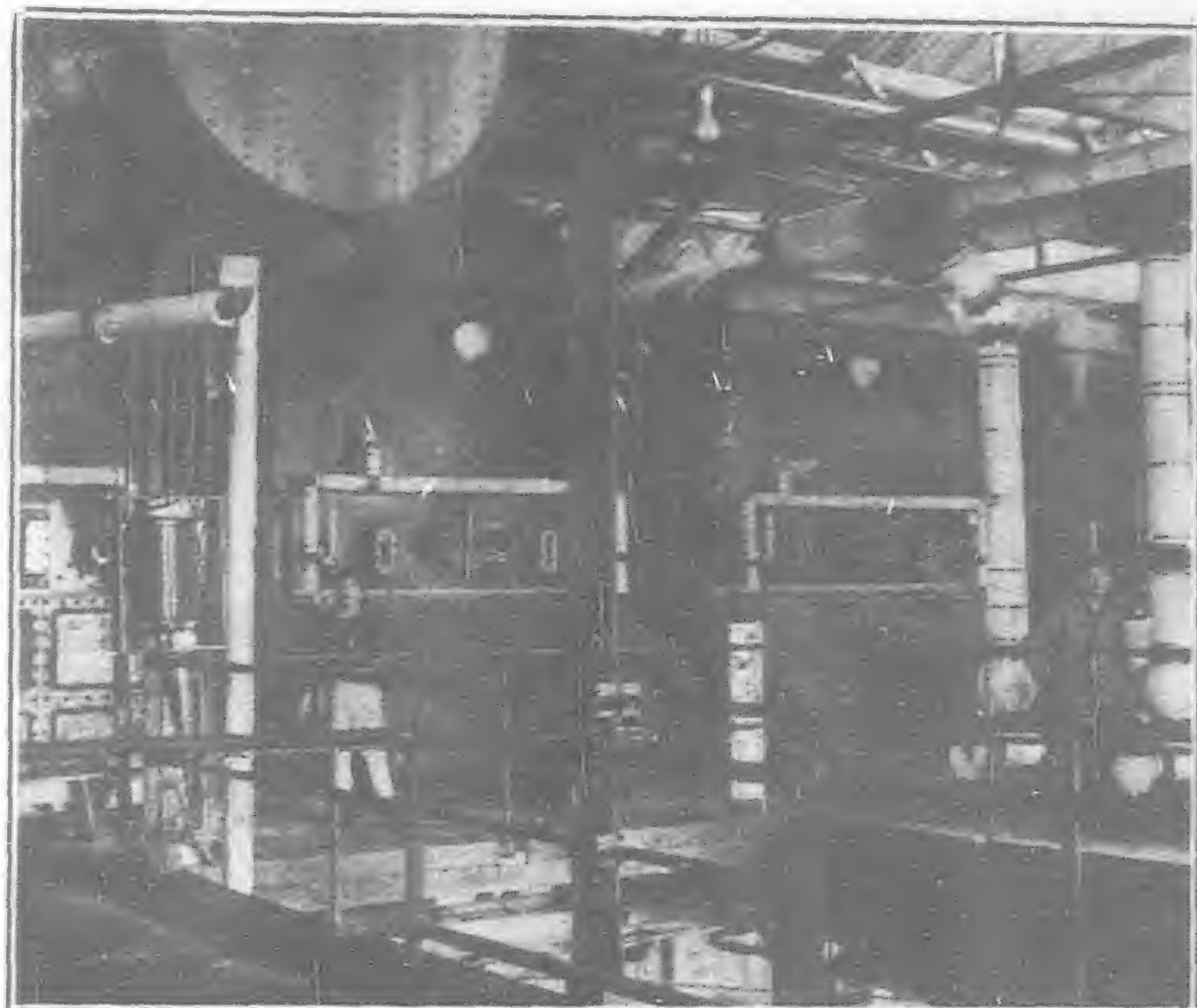


Agricultural Tools used in Cultivation





Meiji Sugar Company's Railway at Takigawa



Evaporators

needed. Unfortunately now when seed is to be obtained, capital is wanting, and the industry is growing in both countries under severe handicaps. And it is only because of the intrinsic value of this industry that all efforts to bring it to maturity have not been abandoned already.

After the war the plans of the Chosen Sugar Company were revived and in 1919 the orders for the plant were issued. An American firm supplied the machinery, and in 1920 the mill was completed at Heijo, Chosen, and started up under American supervision. This factory is not yet, however, working at full capacity. The company while owning some land which it uses to cultivate a supply of beets for its own needs, has decided to depend for its supplies upon the Chosenese farmers. This has eventuated in a steady lack of supply, although the system has met with success in all other beet sugar-growing communities. The strangeness of the crop, and the indifference of farmers to raising it have been handicaps which had to be overcome in Chosen and in Japan as well. But under guarantees to purchase by the companies some progress has been made in turning cultivation over to the farmers. In Chosen the company will eventually turn its own lands over to the farmers, under a *proviso* that a certain portion of it must be sown to beet seeds annually.

The Heijo plant is the same in size and capacity as the two plants erected in the Hokkaido. It will normally handle the crop from 7,500 acres. This crop is to-day about 10 tons of beets per

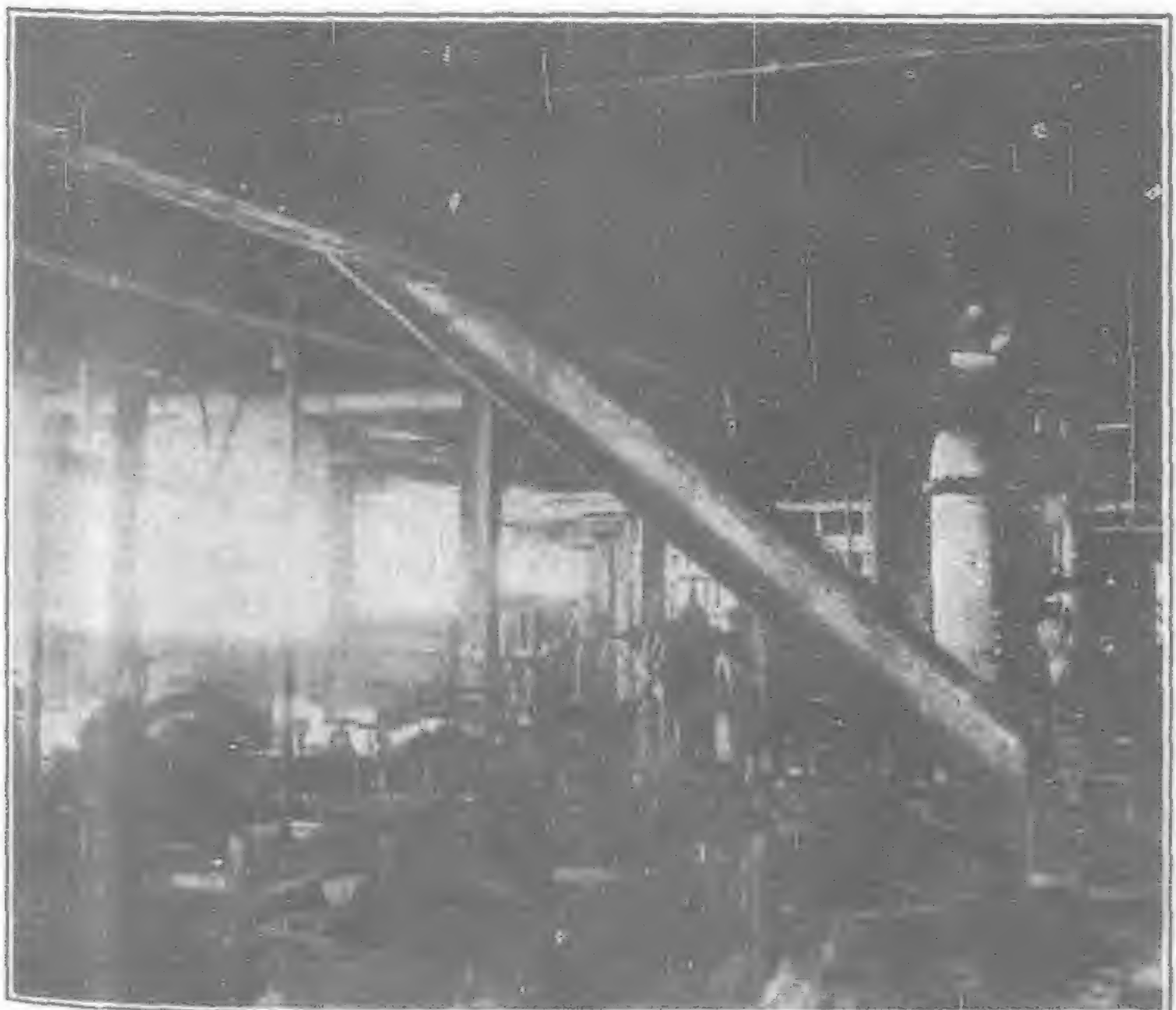
acre, so that there will be about 75,000 tons of beets handled each season. With 600 tons of beets, the daily capacity, producing about 85 tons of sugar, this means an annual production of 10,625 tons of refined granulated sugar a year.

Estimating the production of each of the two mills in the Hokkaido at the same figure, 10,625 tons a year, this makes a total of 31,875 tons of beet sugar from the three Japanese mills now in operation. This is equivalent to 54,167,500 *kin*, something more than half of the Japanese government's estimate of the total production to be obtained in the Hokkaido.

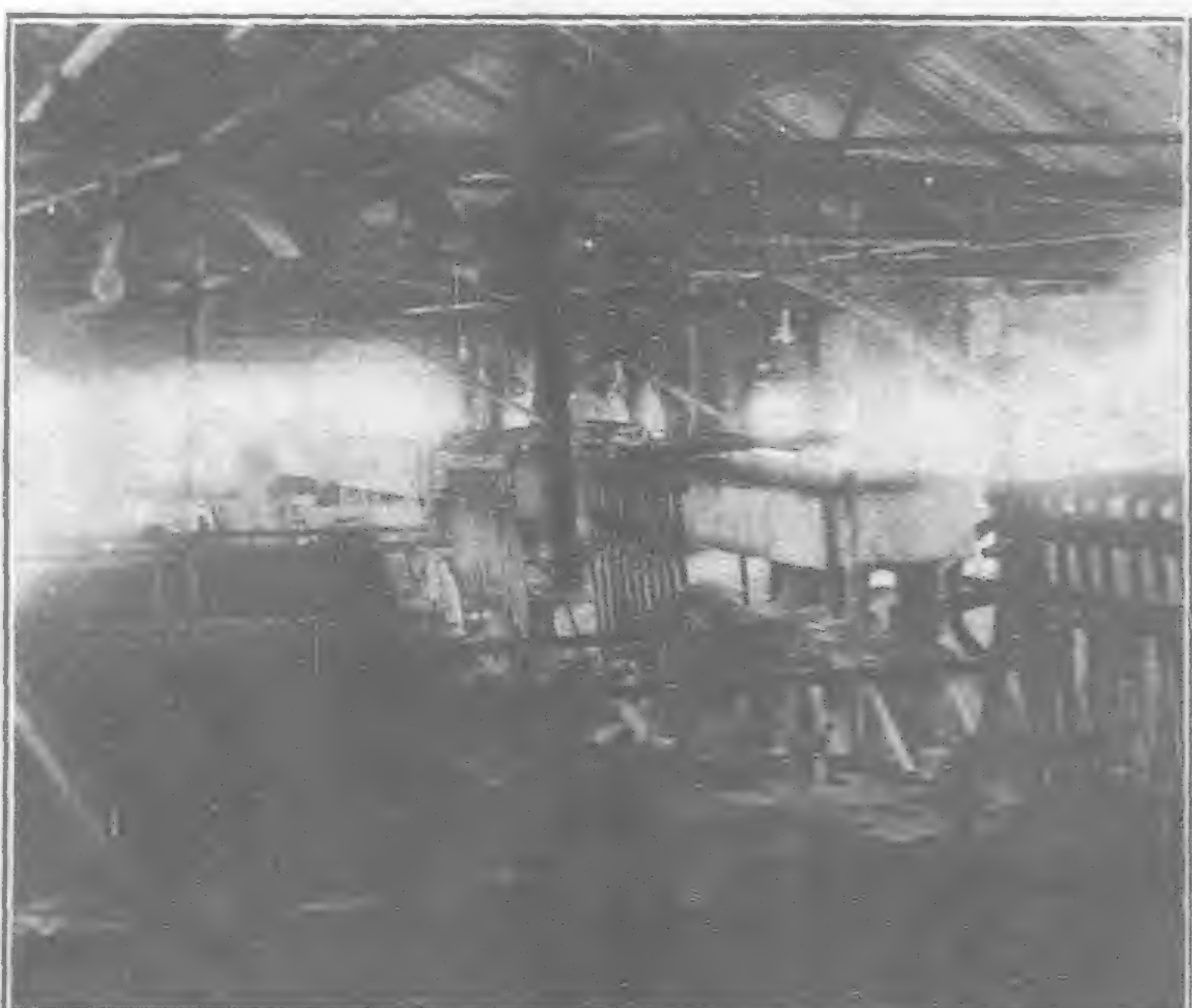
Land in Chosen is particularly suited for sugar beet cultivation, and the Chosenese farmers are gradually becoming accustomed to the crop. When prices of sugar become better, or more settled, there is every possibility of a considerable increase in the interest now more or less grudgingly shown beet sugar. When this happens an increase in production is inevitable.

### Beet Sugar in Manchuria

The Japanese turned their attention to sugar beet cultivation in Manchuria in 1918, and a company to refine was established under the name of the South Manchurian Sugar Manufacturing Co., with a capital of Y.10,000,000. This company included in its operations the manufacture of beet sugar, refined sugar from cane raws, and alcohol.

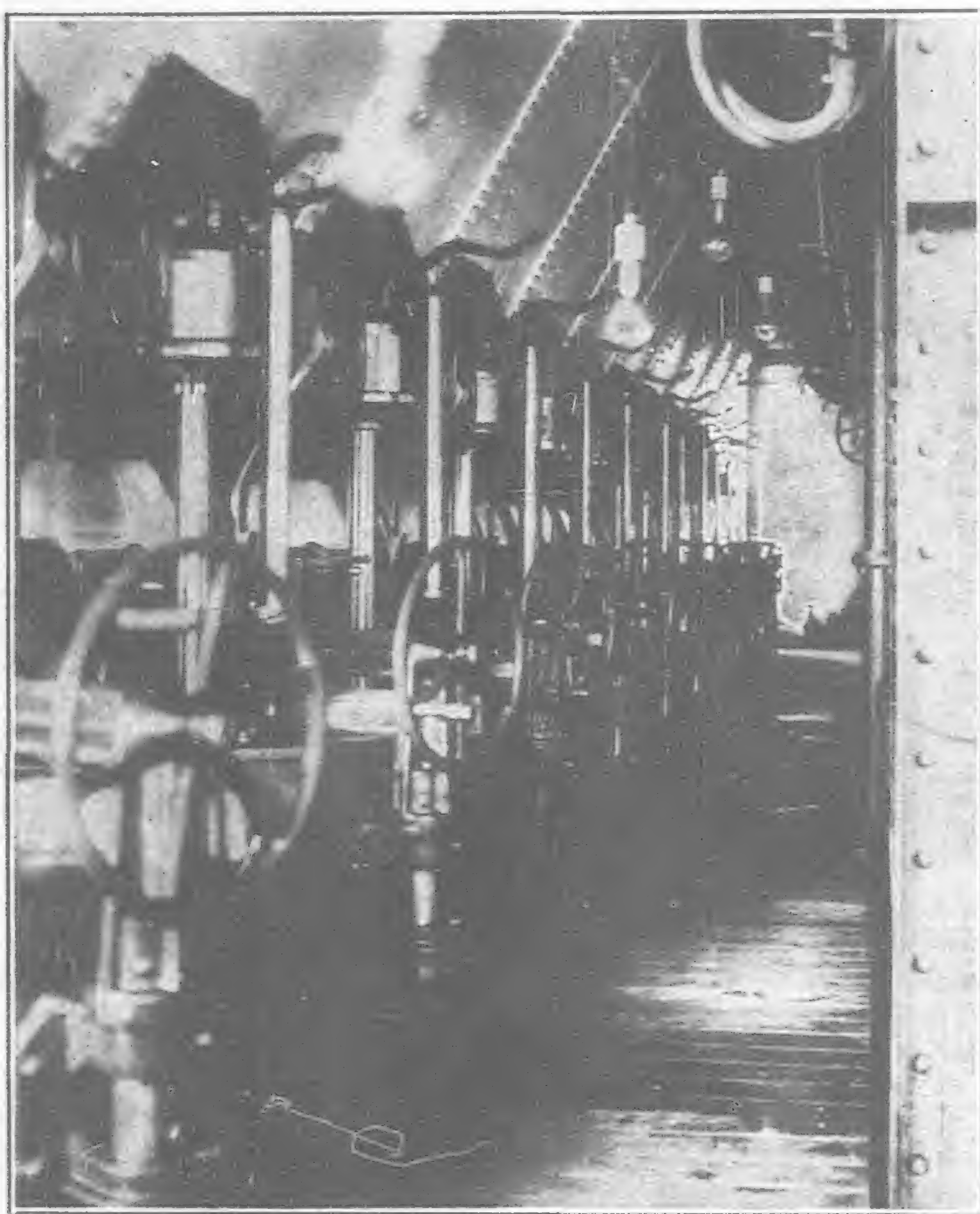


Diffusion Battery, Juice Extractors



Filtration Station. Battery of Kelly Filters





Centrifugal Machines

Sugar beet seed was difficult to obtain and the industry never grew as it should. The company paid dividends on sugar refined from Javan raws. But all preparations for an extensive industry have been made, and in the next five years or so it is probable that Manchuria will enter the beet sugar producing field along with Chosen and the Hokkaido.

### Method of Refining

The whole process of beet sugar manufacture in the Hokkaido is carried on in the following manner:—

The beets are conveyed to the mill from the storage bins by means of concrete flumes, waste water from the mill being used to carry them along. The beets are washed, to remove all foreign

matter, and then sliced into long shreds, called "cossettes," special knives being used for the purpose. These cossettes then pass into the diffusion battery where the juice is extracted. About one-fourth of one per cent. of sugar is left in the pulp residue. This is conveyed to the drying plant (not yet installed in the Heijo plant), dried, packed in bags and sold to dairies for feed.

The raw juice is clarified with lime sacharate and carbonic acid gas, which are produced in the Steffens house lime kiln during the desugarizing process. The next process is filtration, further clarification and filtration until a thin, clear, brilliant juice having a light amber color is produced. Evaporation is then carried out to reduce the bulk of the juice. This is accomplished by a multiple evaporation system of big capacity. The "thick juice" is again clarified and filtered, and is then made ready for crystallisation, which is carried out by means of large vacuum pans capable of turning out 300 bags of refined granulated sugar at one time.

The product from the vacuum pans is known as "massecuite," a brown, heavy mixture of white sugar crystals surrounded by syrup. This is passed through centrifugal machines revolving at a high speed, which separate the sugar crystals from the syrup, which is then pumped into a second vacuum pan where again crystals are produced in the same manner. The resulting "massecuite" is separated in another battery of centrifugal machines.

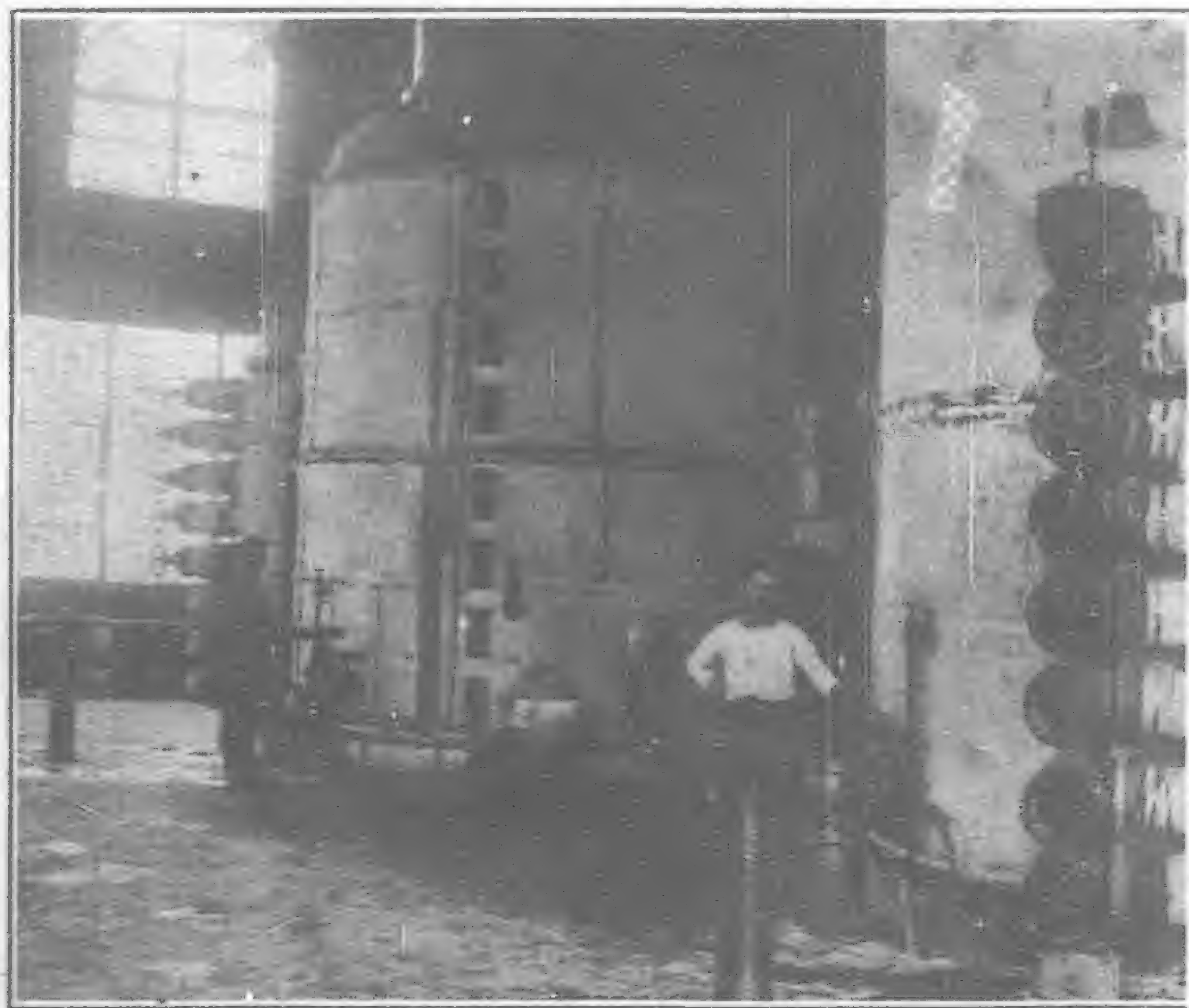
Sugar from the first crystallisation is washed with clean, cold water which removes all traces of the syrup without dissolving any material amount of the sugar, this process takes place in the centrifugal machines. This washed sugar is then passed to the special driers, and the process of manufacture is finished. After being dried and screened, this sugar is ready to be packed.

The sugar from the second crystallisation is yellow-brown in color, and is re-dissolved and sent back to the first vacuum pan where it is mixed with the original thick juice. The adhering syrup from the second making of crystals, after being removed by crystallising is attempted. It is sent to the "Steffens" plant, where it is desugarized as described, by the use of quicklime. This process destroys the molasses by precipitating the sugar, and leaves as a residue a waste of water containing all the salts and minerals which the original beet has taken up from the soil, including a considerable percentage of potash and nitrogen compounds. At present this waste water is not being used, but in time the necessary equipment will be installed to collect this valuable by-production.

## Mercury Mining and Reduction in Kweichow, China

THE mercury mine of Dong-shun-hsien, Kweichow, has been in operation many years. If, what the natives say is dependable, their ancestors were engaged in mercury mining in the Ming dynasty, 1368-1644. The veins are found in the limestone strata and in isolated patches or pockets. There are two kinds of mercury. One is red and transparent, and the other dark-red and opaque. The latter contains a small amount of antimony, but both contain no pyrite.

The methods used in opening the mine and in smelting the mineral are very poor and crude. In opening a mine holes are drilled to a certain depth, and into them 2 to 3-lbs. of gunpowder are introduced. The result of the explosion after the ignition of the gunpowder is 200 to 300-lbs. of mercury ore. After the breaking up of the rocks into small particles they are put into the native furnace for smelting. The furnace consists of three boilers and one earthenware basin. Over the brick foundation of the furnace the first boiler is placed, and the second boiler up-side-down on the first, a 12-in. hole being made in its centre. The second boiler is covered with mud held in place by a bamboo network, and upon this the third boiler, also with a hole in the centre, is placed. This third boiler is then covered by an earthenware basin. After heating, the mercury is evaporated and condensed on the entire surface of the earthenware basin. This is rubbed off and put into bamboo tubes. The mercury obtained in this way is ready for sale.



Vacuum Pans, Sugar Crystallizers



# Diamonds in Dutch Borneo

By A. S. Wheeler, M. Inst. M.M., and J. H. Foran, Assoc. Inst. M.M., in the Mining Magazine

**B**ORNEO has long been known as a diamond-producing country and, before South Africa sprang into prominence and practically monopolized the world's diamond market, the value of its output probably ranked level with, or higher than, that of either Brazil or India.

Tavernier, a Frenchman, writing in 1684, was apparently the first European to record the fact that the gem was found in Borneo, having seen the stones during his travels in Hindustan, where they were greatly treasured by the natives owing to their superior quality to the Indian diamond. Since then various writers such as Raffles and Posewitz (in his book "Borneo") have made brief references to the fact, but no description has been given as yet either of the nature of the occurrence or of the native method of winning the gemstones as far as the authors are aware.

The original matrix of the diamond has not yet been discovered in Borneo, although a few isolated stones are reported to have been found *in situ* in various parts of both British and Dutch territory, but such reports lack corroboration and their authenticity is therefore open to doubt. The present output is derived entirely from alluvial deposits, and there are only two places where the production is of appreciable value. These are at Martapoera, near Banjarmasin, and at Landak, near Pontianak. The former is situated on the south coast of the island, near the port of Banjarmasin, on the Barito River, and the latter at about the centre of the west coast. The Martapoera field is the more important of the two, and the subsequent remarks refer to the mode of occurrence of the diamonds and the native methods employed in winning them in that locality.

The industry is at present entirely in the hands of the local native Banjere, a mixture of Malays and Javanese, although Europeans have entered the field with the intention of introducing big-scale modern methods such as open-cut working and dredging. The diamonds are found in gravel deposits forming the old river beds of the present era and extending often on to the adjacent flats as a result of overflow during periods of flood. The channels are being rapidly silted up with sand, clay, and other fine sediment, with the result that the rivers are now losing themselves in a coastal swamp plain at their outlets. This overburden is barren and increases in thickness going down stream.

The gravel layer is composed of well rounded water-worn pebbles, rarely exceeding 12-in. in diameter, and rests on a bedrock of sedimentary strata decomposed to a clay, and not readily distinguishable as bedrock. Quartz pebbles predominate in the wash, and water-worn pitted pebbles of corundum, with fragments of  $TiO_2$  in the form of brookite crystals, are prominent among the heavier concentrate associated with the diamonds and hence are regarded as favorable indications. A small amount of gold and platinum is also present, but rarely in sufficient quantity to make their recovery the object of special attention by the natives, except when a rich pocket is found when, of course, they collect it.

The native method of working these buried river bed gravels is to sink a shaft to bedrock and to take out as much of the wash around the shaft bottom as circumstances permit. The size of the shaft is usually 1.5 metres square; it is sunk to a depth of five or six feet, and a collar set fixed, from which other sets are suspended by means of rattan at, say, 2 metres centres or less. The shaft is then open-lagged with poles, or saplings, of sufficient length to reach the wash, and these are driven down as the sinking proceeds.

When the ground is too loose to stand with only this support, long grass is packed in behind the lagging.

Each village community ("kampong") has its own diggings, the work being done by parties of men and women who are members of the same family as a rule, since outsiders could not be trusted to abstain from thieving a stone they might chance to see in handling the gravel! Two men work in the shaft bottom excavating the ground with short crowbars or their hands, and packing it on to small wicker trays, which are then handed up from one native to another, standing on the shaft setts, until finally dumped at surface, the empty baskets being passed down. Water encountered in sinking is handled in similar fashion by baling with kerosene tins cut down to about half size with a wooden handle fixed across. The handing up of the full basket or tin and passing down of the empty one is performed so rapidly and dexterously that a surprising amount of water or gravel can be dealt with. A gang of 16 natives (say 12 men and 4 women) will sink a 5 by 5-ft. shaft to a depth of 20-ft. in a day or two, depending on the amount of baling to be done. Native shafts rarely exceed 30-ft. in depth.

The gravel, which is piled in a separate heap from the barren overburden, is then puddled in a prahu, or native canoe, which is 2 to 3 metres long, and hollowed out of a tree trunk. The gravel is placed in this and it is filled with water and pedalled backwards and forwards with the feet by a native seated at each end, while a third native periodically adds water and gravel and removes the puddled material, from which the bigger stones are thrown out by the puddlers. The process is crude and inefficient where the clay is at all stiff.

The puddled ground is now washed ("dulanged") in native bateas ("Linggangan"), which are 75 cm. diameter with a vertical depth of 22 cm. from rim to apex, and made from a single piece of wood. The worker stands in a stream or pool with the water reaching to his hips and taking 2 or 3 kilos of wash, sieves it through a coarse rattan sieve having a rectangular mesh of about 1.5 cm. by 4.5 cm. The oversize is examined for large stones by scraping over with the fingers and tossing over in the sieve before being rejected.

The undersize falls into the batea and is washed. The natives are particularly expert at this; they first thoroughly agitate and mix the material by rabbling it with the fingers, and then, resting the dish on the water, rock it so as to impart a circular swirling motion to the contents. This sets up a wave traveling around the interior of the dish carrying with it the lighter material, and by a slight raising of the hand the rim of the dish is correspondingly depressed on the opposite diameter permitting the overflow of a portion of the wave and its burden of lighter wash. The hand is then depressed allowing fresh water to enter. This completes the cycle. After 8 or 10 turns the wash is again agitated and mixed and once more swirled. The excess water is then drained off and the material remaining in the batea is scooped up with the fingers and spread in a thin even layer on the sides while slowly revolving the batea with the other hand. This renders any diamonds that may be present easily visible to the practised eye of the panner, and he imbeds them temporarily in a small wax-filled hole bored in the rim of the dish.

Fresh material and water are then added and the panning resumed. The concentrate from each cycle of operations is thus retained in the dish until finally panned off for gold and platinum content if present.



Map Showing Position of Diamond Deposits in Borneo



The Borneo gem is held to rank equal, if not superior, to any in the world. The majority of the stones are of good quality, known in the trade as "close goods," whites preponderating; next are the yellow and smoky colors; blue-whites are rare, and occasionally greens and reds are found. In size the stones probably do not exceed  $\frac{1}{4}$  carat on the average. Big stones are extremely rare, the largest found for several decades being a 32-carat fragment and an 11-carat recently discovered (in 1920), and valued at 16,000 and 5,000 florins respectively in the rough; the finding of even a 5-carat stone is a cause of considerable comment and dangerous envy among the workers! The shape is good on the average, well crystallized octohedra predominating, with comparatively few cleavages or fragments.

The diamonds produced are split and polished locally, the mills or spindles being owned by Arabs or local Malays. The splitting of diamonds is a trade, or rather art, requiring considerable experience and skill, as the stone must be split along the proper cleavage planes to obtain a successful result; otherwise it is easily spoiled and its value greatly depreciated. Splitters receive no regular scale of pay, and are usually given a bonus on successfully splitting the larger stones, which it can be readily understood is nervous work.

The polishing is done by setting the diamond at the desired angle in soft metal (a lead alloy), filled into a small brass cup-shaped mould. The spindle forming the extension of this is gripped in a small jaw or vice fixed on the end of a wooden handle or arm about 25 or 30 cm. long. The diamond is then carefully rested on the rapidly revolving horizontal cast-iron disc, or plate, keyed to a vertical steel spindle power driven, the wooden arm being held in position and prevented from moving by two stops (usually nails) driven into the bench, one on each side; the necessary degree of pressure is applied by resting small weights on the arms. By using three or four of these arms or rests the polisher can deal with that number of stones simultaneously, as against the Amsterdam polishers whose practice is reported to be the handling of only one stone at a time.

Cutting and polishing costs may be figured roughly at 6 to 7.50 florins per carat for  $\frac{1}{2}$  carat stones and under, and at 10 to 15 florins for larger stones. The florin rate of exchange varies from about 11 to 12 to the £1.

Each polisher has to provide his own disc; the abrasive is obtained from Ceylon; and coconut oil has been found to be the most suitable lubricant as it spreads evenly and does not clog.

Natives often cut and polish their own stones, hiring the spindle from the mill owner.

The main objective in the local mills is to produce a stone of maximum size, sacrificing brilliancy to attain this end, whereas in Europe the weight is far less important than maximum brilliancy or fire. Hence there is a considerable difference in the price a cut stone would fetch in the Oriental native market and in Europe; for whereas it might, and probably would, be regarded in the latter as spoilt by local cutting, it would fetch a good price in the Orient.

There were several mills in operation before the war, but at the time of writing only two mills (of 60 spindles) were running. This is due to the fact that the import of South African stones, which practically ceased on the outbreak of hostilities, has not yet been resumed on the pre-war scale, though they are now reappearing.

Formerly, parcels of rough Cape diamonds were cut and polished here to the extent of more than half the output of the mills, and found a ready sale in the Far East at lower prices than Martapoera stones. Wealthy Chinese (outside China), Malays, and Japanese are inordinately fond of the most extravagant display of jewellery, setting diamonds in the links of the watch-chain, and bedecking their womenfolk with huge and hideous gem-studded pendants more like a breast-plate than a necklet, which are worn at every possible function and occasion: the purchase of these ornaments is regarded by them as a form of investment.

## The Magnesite Deposits of Manchuria

By S.M.R. Co. Geological Institute, Dairen

THE magnesite deposits occur at intervals in the form of lens or bed alternating with dolomite throughout a range extending from Kuanma-shan, 5.5 k.m. east of Tashihchiao (210 k.m. north from Dairen, and 154 k.m. south from Mukden) as far as

Moku where one of the principal talc deposits is located, about 30 k.m. northeast of Tashihchiao station. Others occur at a number of places along the South Manchuria Railway in the southwestern direction, to a point 8.5 k.m. southwest of Kaiping station (29 k.m. from Tashihchiao).

Although the deposits now being worked are confined to Kuanma-shan, Niu-Hsin-shan and Pai-hu-shan, yet there are many other fields large enough to be worth operating, in other parts of this district.

The entire exposed deposits cover large areas estimated at 11,552,000 *tsubo* (350 square kilometres approximately).

The main deposits of this seam, which constitute the north-eastern portion, from a mountain range rising from 250 metres to 500 metres above the plain level, while the remaining part in the southeast takes the form of mounds, only 50 metres high, or takes hollows.

Talc deposits are found in association with the magnesite chiefly in the very sheared zone.

The geological formations observed in this area are gneiss, pre-Cambrian system, alluvium, granite, and several dike rocks. The general geologic section of this district is as follows:

Quaternary	..	..	Sand and gravel.
Dikes	..	..	Porphyritic diabase (?) and quartz porphyry.
Cambrian	..	..	Absent.
Algonkian	..	..	(lower part, slate, schists), (upper part, dolomite, magnesite, marble, quartzite and sandstone, etc.)
Archean (?)	..	..	Gneiss.

Gneiss generally belongs to biotite granitic gneiss of uniform texture, and is overlaid by the pre-Cambrian (perhaps by algonkian) schists and slates. The lower part of this schist complex are characterized by some accessory minerals such as staurolite, garnet, and andalusite, etc., constituting the mountain range of surface formations throughout, especially extensively distributed over the southern part of this area.

The upper part consists generally of schist, dolomite, or of alternation of schist, slate, and dolomite, etc.

The youngest rocks of this region are dikes classed as pre-Cambrian and the youngest sedimentary rock is quartzite. Beneath the latter unconformably lie an older rock series of the same descriptions as given above.

These rocks are intruded by later pre-Cambrian granite, syenite, and other igneous rocks.

With their varying degrees of resistance to erosion and weathering, magnesite and dolomite constitute the principal ridges traversing the area, forming excellent magnesite deposits and takes a north-eastern course.

The deposits are composed of a hard coarse crystalline mass of magnesite and are found generally in beds or lenses alternating with dolomite, showing a distinct contact line with dolomite. They also associate with a thin bed of schist or slate occasionally.

The relative position and number of beds of these geological constituents are not constant, but the total thickness of these two layers (magnesite and dolomite) is at least 15,000 metres, of which the dolomite takes up over 70 per cent., and the magnesite beds less than 30 per cent.

As to talc, the S.M.R. Co. has suspended mining altogether. The sales returns for magnesite these three years follow:

Fiscal year.	
1920	.. .. 4,204 tons.
1921	.. .. 3,078 "
1922	.. .. 5,112 "

The price quoted ranged between 3 yen and 3.50 yen per ton for delivery at either Tashihchiao or Tapingshan station.

As to talc at Haicheng, the returns were as under:

Fiscal year.	
1920	.. .. 837 tons.
1921	.. .. 2,543 "
1922	.. .. 2,466 "

The price quoted on talc in its natural form, not including packing charges, was from 8 yen to 8.50 yen per ton.

It may be added the above represents what was handled by the S.M.R. Co. only.

The total annual demands at present may be placed at 7,000-8,000 tons of magnesite, and 10,000 tons of talc.

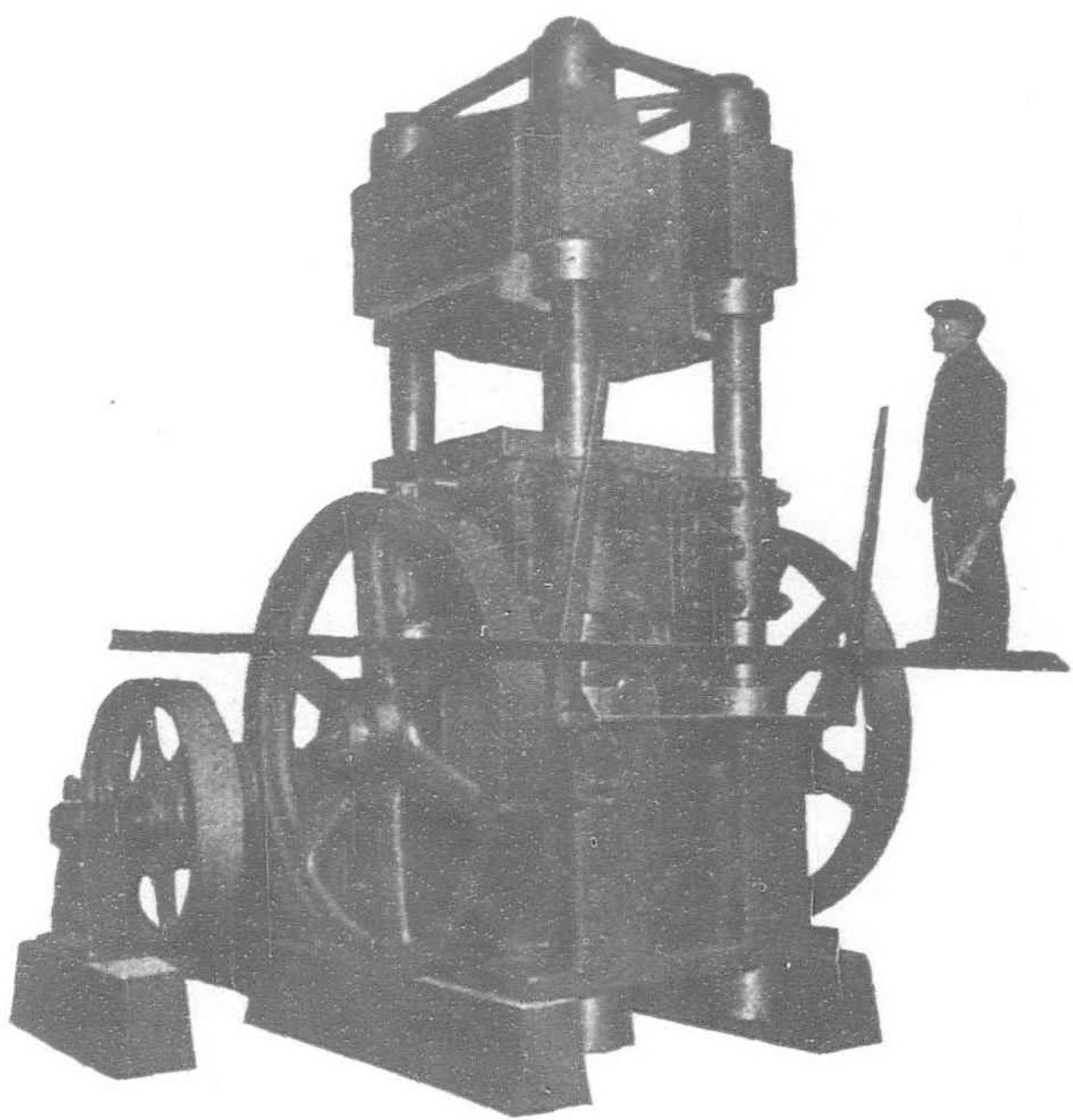


## The Increased Demand for Metal Ceilings

THE rapidity with which metal ceilings are growing in favor in all parts of the world is due chiefly to two reasons:

- (a) The relative high cost of lath and plaster work.
- (b) The many advantages of metal ceilings, including architectural beauty, fire resistance, permanence and security.

The former impossibility of obtaining accurate and precisely cut designs when such designs were formed by drop hammer stampings no longer exists. The introduction by such firms as the Berger Manufacturing Company of the use of the draw press for the formation of metal ceilings has removed this lack of precise detail. In addition to this, the use of the draw press has established a uniformity in designs heretofore lacking. Draw-presses in use for



this purpose are capable of exerting a pressure of 900 tons on a single plate. Formerly metal ceiling designs were simply reproductions of molded plaster work and were, in general, too ornate and, due to rapid change of pattern and the destruction of dies, lacked a permanence of detail and continuity which prevented purchasers from making extensions to ceilings already installed. The use of the draw press now permits not only a variety of designs suitable to all tastes and styles of architecture, worked out with a depth, sharpness and uniformity of detail impossible to the early processes but, at the same time, through the careful retention of obsolete dies, permits customers to-day to obtain the same design they ordered a number of years ago.

The qualities enumerated above have caused architects and construction engineers all over the world to appreciate the advantages of the use of metal ceilings and to specify them more and more for residences, schools, churches, stores, theatres, public halls and industrial and office buildings. There has been an especially rapid development of use for service in places where the flaking off and falling of plaster would be peculiarly disadvantageous. In particular, the use of metal ceilings and side walls has increased tremendously for use in establishments and rooms devoted to the painting of various products; experience has shown that the use of other types of ceilings and side walls is apt to injure and ruin the painting and finishing of products due to the sifting down and settling upon the fresh paint and finish of flakes and powdered plaster. For instance, the General Motors Company have put up 70,000 square feet of steel ceilings in the finishing and painting rooms of its Muncie, Indiana, plant in order to prevent plaster dust from falling and spoiling fresh paint.

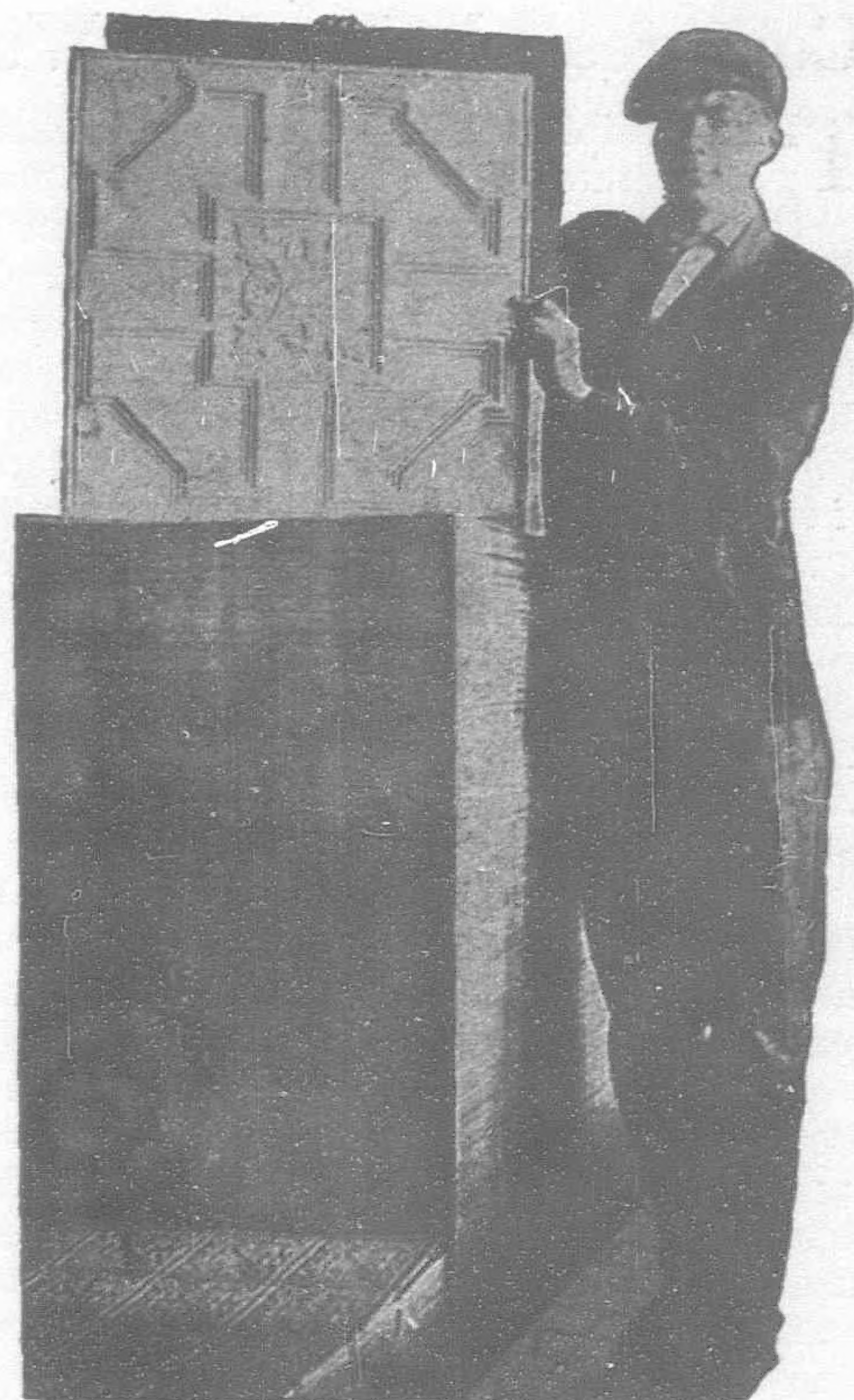
This immunity from cracking, flaking or deteriorating, taken together with general strength and light weight, make metal ceilings especially serviceable in places where there is danger of earth tremors. As an example, we are told of their adoption by a Roman

Catholic Church, St. Joseph's at Marblehead, Ohio, near the shore of Lake Erie, where the jars from frequent blastings at the near-by limestone quarries do not permit the use of plaster.

The fire resistance of metal ceilings is one of their greatest advantages. And this, undoubtedly, is one of the reasons why, of late years, these ceilings have been used so extensively in churches, schools, stores, public halls and industrial and office buildings, where the hazard of fire introduces great jeopardy. Metal ceilings innumerable cases have prevented the spreading of fire from floor to floor and thus have been extremely helpful in checking losses of both property and lives. There are many instances where the use of metal ceilings and side walls have essentially assisted fire fighters in getting fires under control and saving lives and property.

Another important advantage of metal ceilings is that they successfully resist the attacks of rodents and insects. This makes them especially desirable for use in countries where these forms of life swarm.

A matter of especial interest is the increasing demand for American manufactured metal ceilings in foreign countries. These are being shipped in increasing quantities to all parts of the world. As an example of appreciation and satisfaction, we may cite that a Canton manufacturer has been shipping to various points in India for the last ten years many thousands of dollars' worth of metal ceilings, while in every Latin American country there are hundreds of Parish Churches importing these ceilings. The large increase in the demand for and use of the metal ceilings shipped by this manufacturer is undoubtedly due, in part, to the excellent priming oil and lead coat with which these ceilings are finished and which naturally preserves them in good condition until erected, after which they will last a life time if kept well painted; previous to the practice instituted by this manufacturer, ceilings were generally sent out protected merely by a coat of white-wash.



## A Super Power Project for Manchuria

ACCORDING to a Mukden despatch, Colonel Machina, adviser to the three eastern provinces, is planning to start an electric enterprise somewhere along the upper reaches of the Yalu and, with the help of Mr. Kurihara, expert, conducting investigation to that end, has now decided, prompted by the encouraging results obtained, to establish an electric company under China-Japanese management after obtaining permission from Marshal Chang Tso-lin. As a first program, it has been planned, so says the despatch, to construct plants capable of generating a total of 100,000 kilowatts, and it is expected that, when work on the entire program is completed, no less than one million kilowatts will be available. At that time, it is expected the company will supply the railways, tramways, and other industrial interests in Manchuria and Mongolia with electricity at the lowest rate possible. It is understood that the South Manchuria Railway, naturally much interested in the project, will shortly appoint a party of forty to investigate all necessary arrangements to be made thereanent, particularly as regards the actual situation of the project.



## Compressed Concrete Works, Singapore

THE possibilities of compressed concrete pipes as a superior substitute of the cast iron pipes for purposes of irrigation, sewerage, hydraulic schemes of all kinds, and for manifold other uses have occupied the attention of engineering experts all over the world for several years, but it is only during the past year, by the establishment of plant for the production of Hume pipes, that Singapore has been given the opportunity of judging for itself, says the *Singapore Free Press*. Here, where a water scheme of considerable magnitude is on the eve of fulfilment and the town's sewerage clamors for attention, the matter has a peculiar interest. The questions "Will Singapore's water supply of the future flow from Johore, beneath the Causeway and across the island through concrete or steel or cast iron pipes?" Will Singapore sewage be disposed of through one of these three mediums?, are questions which must exercise the minds of any who have considered the relative qualities of the three materials.

The use of concrete and steel in combination was completely revolutionized by the discovery in 1910 of the process, whose romantic rise to fame can scarcely have been surpassed. Thirteen years ago when concrete pipes were as yet undreamed of, two brothers—though they lived in Australia they originated from Scotland—Mr. E. J. Hume and Mr. W. R. Hume, were manufacturing ornamental steel work in Adelaide, with successful and profitable results. Seeking further scope for their enterprise the brothers turned their attention to concrete and it was not long before they realized the immense possibilities of combining it with steel. They concentrated their energies and experiments in combining these two materials for the purpose of producing pipes of an improved type, suitable for water supply purposes. By the use of centrifugal force the concrete was compressed and the steel embedded in it in a way that gave perfect results. The practical application of the invention occupied the brothers for the next two years, years which were full of difficulties and disappointments and disheartening results. But eventually success was completely achieved and a perfect pipe was produced. A long time elapsed before the inevitable reluctance of engineers to give practical support to the undertaking was overcome but after the ice had been broken orders flowed in freely, and the success of the Hume pipes was assured. Early orders included the contract for the laying of 96,000-ft. of 4-in. pipe for telephone conduits, about 30,000-ft. of 9-in. pipes for the Port Adelaide sewers and about 6,000-ft. of large pipes for the East-West Transcontinental Railway. The reputation of the Hume pipes spread from South Australia and steps were taken for the development of the work in England, America and South Africa. The war, however, put an end to negotiations but it also had the effect, through the shortage of other materials, to assist the development throughout Australia, where large works were established throughout the continent. Forty miles of sewer pipes were laid in Melbourne, ten miles of high-pressure water pipes were laid in Hobart, Tasmania, and there was a new and important departure in Queensland, where large concrete cylinders were supplied for the sinking of 150 wells, cylinders also being manufactured for wharf construction in Burnie, Tasmania. Now the South Australian government have contracted with the Hume Pipe Company for £3,000,000 worth of pipes for the River Murray irrigation and reclamation scheme, a powerful company has been formed in South Africa; and in England the patent rights have been taken over by the Starton Ironworks. This is one of the most significant episodes in the history of the Hume pipes. A firm which is one of the world's largest manufacturers of cast iron pipes has decided to embark on a new industry which is in direct opposition to its own, realizing that the cast iron pipe has been superseded.

It will be seen, therefore, that from an inauspicious beginning the process has been developed until it has come to be of world-wide importance from an engineering standpoint. It has been adopted in countries all over the world, and is now being patented in the Straits, where during the last twelve months works have been established in the Serangoon Road adjoining the Woodleigh filters.

The process is an extremely simple one but is the result of years of experimental work. The materials for making the concrete are obtained on the island, the sand from the adjoining filters and the metals from Mandai quarry. The reinforcement is made separately, being woven, into a casing, on a revolving drum the texture of the steel wire depending upon the pressure of water the pipes are intended to resist. The reinforcements are placed inside

a cylindrical mould with movable adjustmens to allow of all sizes of pipes being manufactured. As the mould slowly revolves by friction drive the machine mixed concrete is fed into each end from the bed of the plant and distributes itself equally. The concrete is compressed to a wonderful density by centrifugal action. The speed of the revolution is increased, the superfluous water is expelled as there is no inner mould to impede it and a finished pipe is produced in a few minutes. The simplicity, rapidity and economy of the process is most striking. Pipes are made from 10-ft. in diameter to 4-in., the latter being made four at a time on a single machine. The extraordinary effect of centrifugal action in compressing, drying and finishing the pipes is realized when one finds it impossible to make a mark by pressing the thumb with all one's weight on the newly made pipe. The pipes, with no inner mould to support them, are rolled away in their cases placed in a steaming chamber for four to six hours, then rolled into the open, stripped of their casings and rolled off as finished pipes, being left in the open to mature for about thirty days. In this connection Singapore climatic conditions have to be dealt with, and the pipes have to be watered daily while left in the open. The engineers saw the various makes of pipe tested and were also able to inspect pipes which had been laid at the works.

The policy of the Hume Company, Mr. Williams told a *Free Press* reporter subsequently, is to save costs and the risks of transport by establishing field plants wherever possible right on the site of the work. The matter of establishing a permanent plant in Singapore or its vicinity was being dealt with, and an enormous quantity of Hume materials would then be able to be manufactured. Special attention is being devoted to anti-malarial pipes, and the qualities of the ordinary water pipes are being tested by the municipality, for whom the Company are constructing a 30-in. main from Kallang reservoir to the Woodleigh filters, the first job which the Company has undertaken in Malaya.

## The Siam Cement Company

THE celebration of the tenth anniversary of the Siam Cement Company, which has recently taken place, draws attention to the industrial possibilities of that country, and is therefore deserving of more than passing notice in "The Record."

Hitherto it has not been possible to regard Siam as an industrial country, in the accepted sense of the word, and in fact the Siam Cement Company is the first purely industrial enterprise of any magnitude to achieve what may be called a permanent success.

The first conception of a local cement factory originated as far back as 1895 but although thorough tests of raw materials were made at that time with satisfactory results, the attempt fell through owing to lack of financial support.

In 1913, however, his majesty the king became keenly interested in the question, and the scheme eventually materialized in the formation of the present Company, which was registered on the 14th of June, 1913 with a capital of Tcs. 1,000,000, under the style of "The Siam Cement Co., Ltd." Siamese capital preponderates and his majesty is a large shareholder himself.

A site between Bangsue Railway station and Klong Prem, about five miles out of Bangkok, with good facilities for both rail and water transport, was chosen for the establishment of the factory.

The necessary plant, consisting of a rotary kiln 120-ft. long, with corresponding mills for grinding the raw materials and re-grinding them when fired, was ordered, and the factory started working in May 1915. Since that time it has been steadily turning out a yearly output of 140,000 casks, which has been practically all absorbed locally. The total export for the whole eight years does not exceed 20,000 casks.

The principal raw materials required for the manufacture of cement are clay, marl or chalk, coal and a small amount of gypsum.

The Company possesses a big clay field adjoining the factory, which will supply sufficient material for at least fifty years, and as clay of the same good quality is found in the whole Menam valley, the supply may therefore be considered inexhaustible.

Marl was at first transported by rail from a deposit near Chong Kæ station, some 180 kilometres north of Bangsue, but later on a deposit of the same quality was found near Ban Moh station, only 90 kilometres from Bangsue, and this being much nearer than the deposit at Chong Kæ, the Company now takes its supply of marl, about 50,000 tons a year, from Ban Moh, reducing thereby its



transport expenses by a considerable amount. The supply of marl is also unlimited.

When the factory was first started, liquid fuel was used for heating the rotary kiln, but it was soon found that coal was far more economical as fuel, and in 1917 a plant for drying and pulverizing coal was installed, since which time pulverized coal has replaced liquid fuel entirely for heating purposes.

Anthracite coal has up to now been imported from French Indo-China, but lately a portion of the Company's requirements of coal has been obtained from a Siamese Coal Mining Company, which started operations some months ago in the Southern (peninsular) part of Siam, and the results obtained from the use of this coal, which is lignite, have been quite satisfactory.

Gypsum is found locally, but as the deposits are far from the railway, the cost of extraction and transport is very heavy, so that local suppliers of gypsum cannot at present compete with prices quoted from abroad.

As all the raw materials were tested very carefully before operations were started, and the plant ordered was of the best possible design and make, the Siam Cement Co., Ltd. has succeeded in turning out Portland cement of good quality from its inception; and the numerous buildings erected in Bangkok during the last eight years, in the construction of which locally manufactured cement was used, prove satisfactorily that the quality of the cement has been kept up to the required standard.

It may be mentioned here that Portland cement is a name accepted throughout the world for cement manufactured according to a certain process, and that the name has nothing to do with the locality. The origin of the name lies in the fact that the color of the first cement produced was the same as that of the rocks near Portland, on the south coast of England.

The trade returns of the Siamese customs department for 1913 and the preceding years show an average import of about 120,000 casks of cement annually, and it was therefore decided to design the factory with a capacity corresponding to this figure; but the use of cement during the last eight years has become very popular, and although the actual output of the factory has been as much as 140,000 casks per year, a considerable amount of cement has also still been imported yearly. It was therefore decided in

1921 to increase the capital of the Company to Tcs. 3,000,000 (of which Tcs. 2,625,000 has been called up) and to install a second and larger rotary kiln, 180 feet long, with corresponding mills for grinding and re-grinding.

On the 14th of June, 1923, when the Company celebrated its 10th anniversary, all the new machines were in working order, and the capacity of the whole plant is now 300,000 casks a year.

The present labor force consists of 230 Siamese (of which 200 are men and 30 women) and about 70 Chinese.

The Siamese laborers are chiefly employed in the factory to look after the machines, for which kind of work they have proved themselves well adapted, while the Chinese are employed for the rougher work of transporting the raw materials, packing the cement and so forth.

The Company has always made a point of providing the labor staff with sanitary dwelling houses, with the satisfactory result that a large number of the laborers have settled down at Bangsue.

In addition to having achieved a technical success, The Siam Cement Co., Ltd., has also been successful financially, although it has had to meet a strong competition from imported cement in the local market, the import duty of 3 per cent. being so low as to afford practically no protection to the home industry.

The following figures of expenditure, covering a period of eight years from May 1915 to May 1923, are interesting:—

	Total for 8 years Tcs.	Annual average Tcs.
Wages ... ..	957,668	119,708
Electrical power ... ..	632,470	79,060
Raw Material		
Railway freight for marl, etc. ...	895,390	111,923
Coal ... ..	1,779,630	222,453
Pebbles and gypsum ... ..	51,084	6,385
Import duty on machinery ...	57,955	7,242
	4,374,197	546,771

The total production for the eight years amounts to 1,096,180 casks, or an annual average of 137,023 casks, and the average dividend paid over the same period is 12 per cent.

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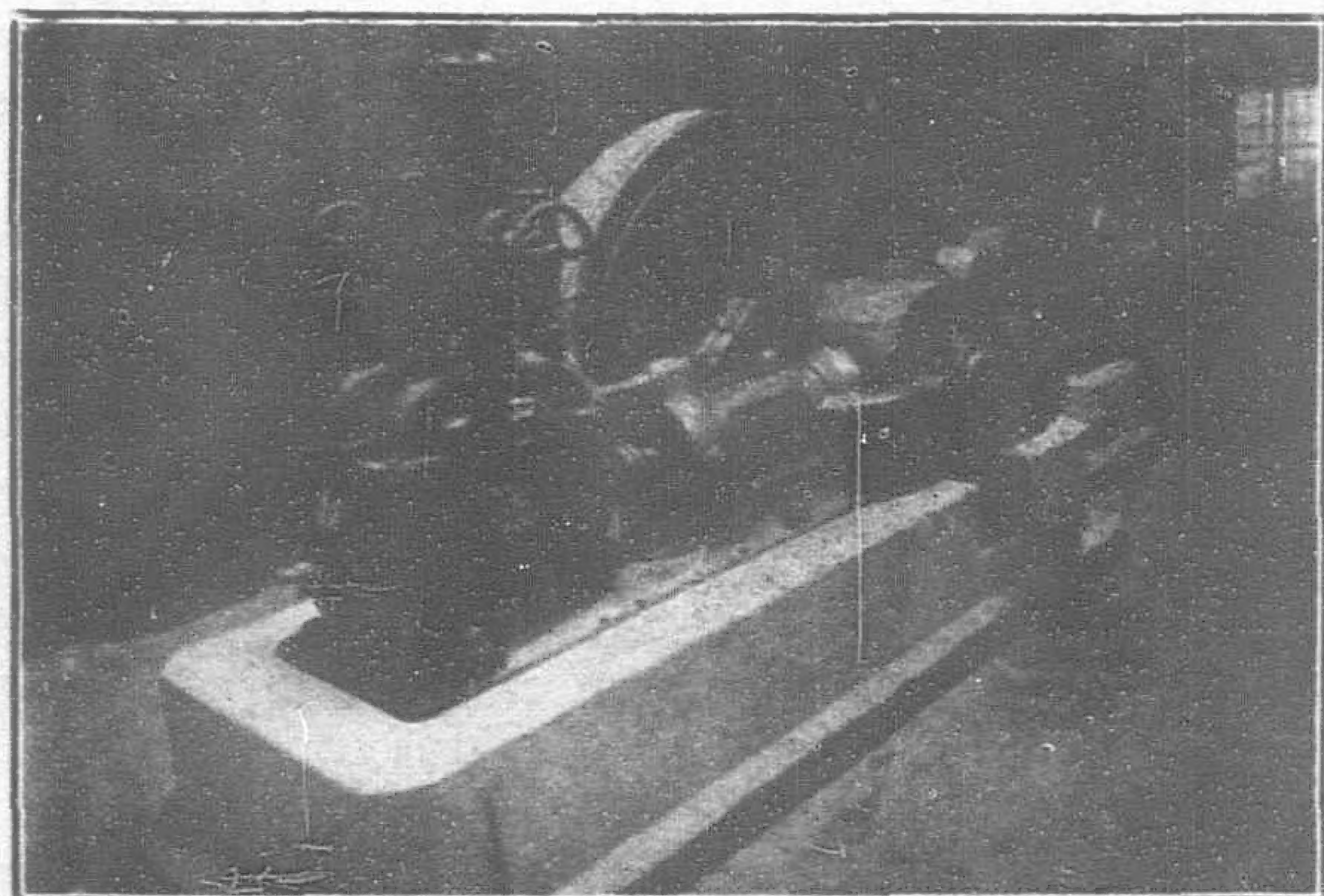
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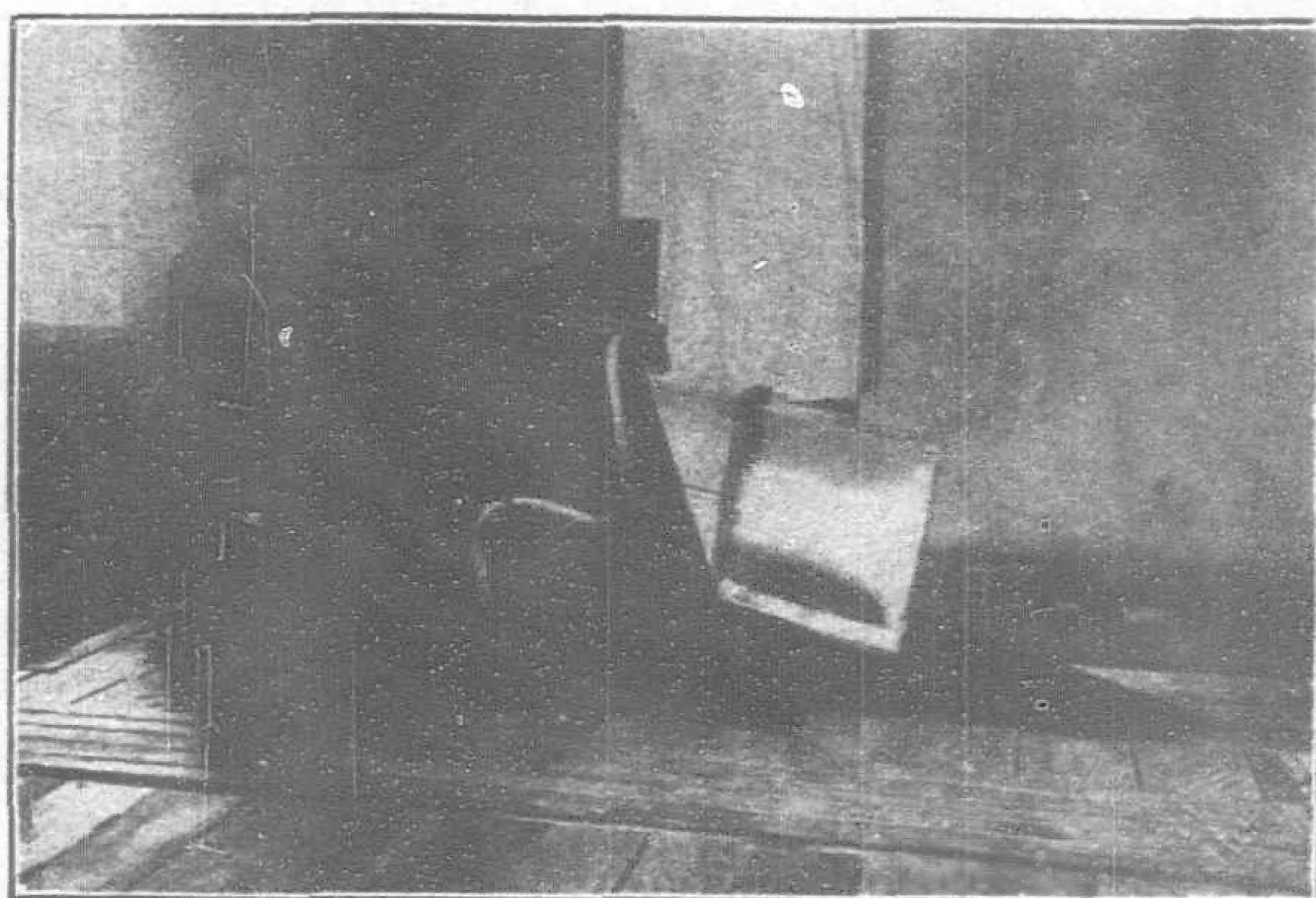


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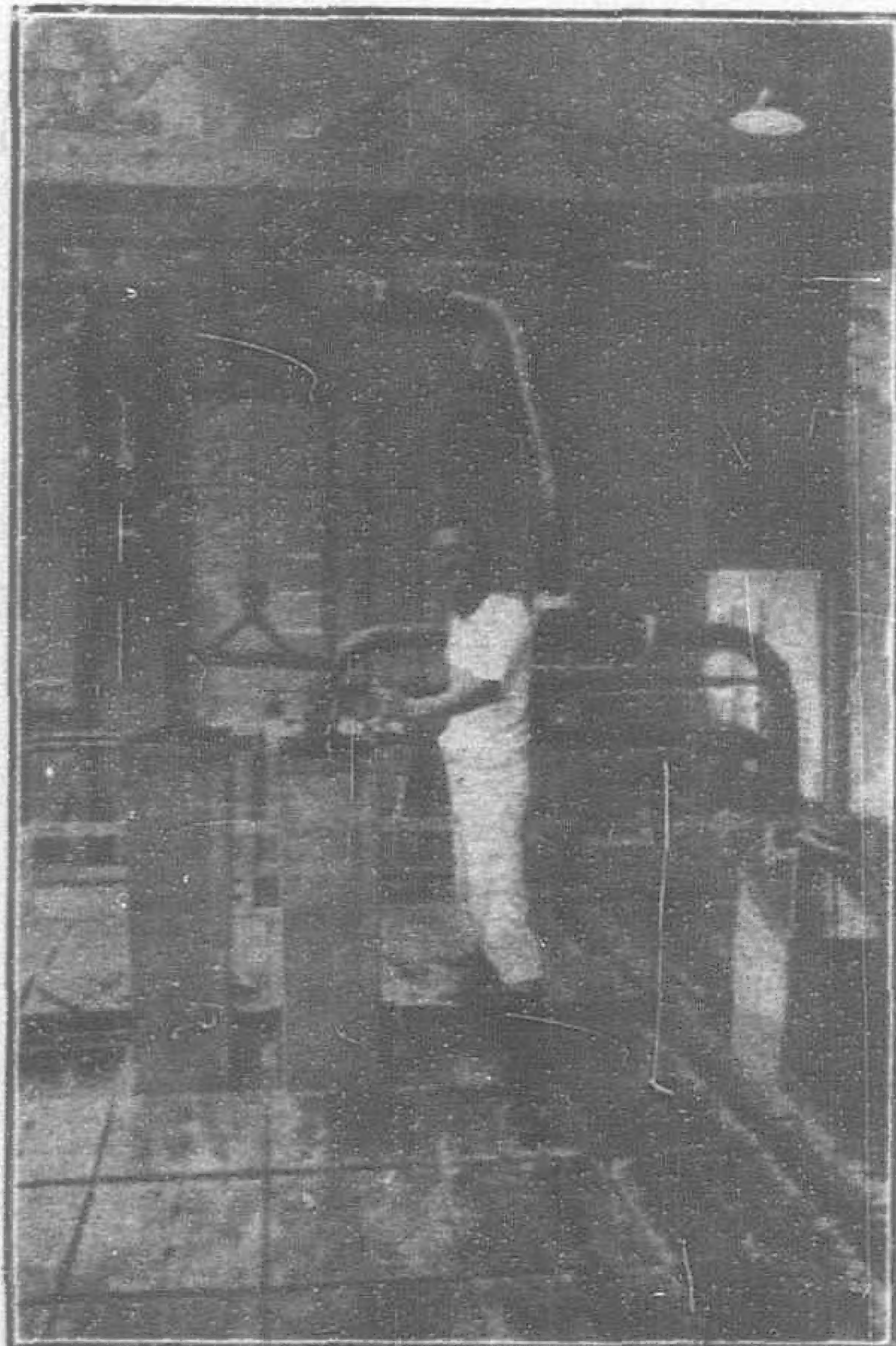
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